Middle South Umpqua Watershed Analysis

Roseburg District
South River Resource Area

Draft September 17, 1999

Revised November 30, 1999

Watershed Analysis Team:

Paul Meinke	-Coordinator
Nancy Duncan	-Wildlife Biology
Rob Hurt	-Fisheries
Lowell Duell	-Hydrology
Dennis Hutchison	-Soils
Jeannette Griese	-Silviculture
Kevin Carson	-Silviculture
Gary Basham	-Botany
Dave Mathweg	-Recreation
Don Scheleen	-Archeology
Bill Adams	-Fire and Fuels Management
Bob Gilster	-Engineering/Roads/TMOs
Dave Roberts	-GIS Support
Ralph Wagnitz	-GIS Support
Joe Ross	-Management Representative

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Executive Summary
Middle South Umpqua WAU

Characterization

The Middle South Umpqua WAU covers approximately 59,397 acres. The Bureau of Land Management administers approximately 7,682 acres (13 percent) of the WAU. Approximately 20,734 acres (34 percent) of the WAU is in nonforested conditions, mainly agricultural (17,758 acres, which is 30 percent of the WAU). Bureau of Land Management administered lands are composed of Matrix and Riparian Reserve Land Use Allocations. Approximately 3,828 acres (50 percent) of BLM-administered land are available for intensive forest management. This would be about 6 percent of the WAU. Activities on BLM-administered lands would have a minimal impact at the watershed scale.

Timber harvesting, agriculture, and transportation have been the main human uses in the Middle South Umpqua WAU. The towns of Dillard and Tri City are located in the WAU.

The watershed analysis uses the format presented in the Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis. The Key Issues, Findings, and Recommendations and Restoration Opportunities summarize the information included in the watershed analysis.

Key Issues

The following issues and concerns were identified during the analysis.

Potential areas for timber harvesting in the WAU.

The amount of timber harvesting during the past 30 years in some Drainages of the WAU.

The amount of late-successional habitat in the WAU.

The distribution and condition of habitat used by special status species in the WAU.

Condition of the Riparian Reserves (vegetation conditions and effects of roads).

Water quality.

The impacts roads have on streams due to sediment and road encroachment.

Restoration opportunities in the WAU.

Findings

Vegetation

Bureau of Land Management administered land comprises approximately 13 percent of the WAU.

About 50 percent of the BLM-administered land in the WAU is available for timber harvesting.

There is no access to some BLM-administered lands in the WAU.

Approximately 30 percent of the WAU is agricultural land.

Port-Orford cedar has been planted in the WAU. It is unknown if the Port-Orford cedar root disease (Phytophthora lateralis) occurs in the WAU.

Hydrology and Fisheries

Road densities range from 3.86 to 5.74 miles per square mile. The road density for the WAU is 4.67 miles per square mile.

Water quality concerns include high stream temperatures and low dissolved oxygen levels in Rice Creek that do not meet state water quality standards.

Wildlife

Northern Spotted Owl

There are approximately 1,898 acres (about 25 percent) of BLM-administered land in the WAU considered to be northern spotted owl suitable habitat.

There are two northern spotted owl sites within the WAU. One site is on BLM-administered land.

Recommendations and Restoration Opportunities

Vegetation

Management activities should conform to the BLM Port-Orford Cedar Management Guidelines to limit the spread of the Port-Orford cedar root disease.

Conduct regeneration harvests on Matrix lands in conformance with the RMP.

Manage young stands to maintain or improve growth and vigor and improve stand structure and composition.

Soils

Best Management Practices (BMPs) should be applied during all ground and vegetation disturbing activities. Along with BMPs, the Standards and Guidelines in the RMP should be implemented in order to achieve proper soil management. Best Management Practices should be monitored for implementation and effectiveness in order to document if goals are being achieved.

Hydrology

Consider stabilizing bank erosion in main channels and decreasing peak flows in areas with unstable soils.

Consider monitoring stream restoration projects for temperature, turbidity and sediment, and channel morphology changes.

Consider conducting stream surveys to help in designing stream restoration projects, such as removing culverts when decommissioning roads or replacing culverts on fish-bearing streams.

Some roads to consider fully decommissioning or improving are listed in Appendix G. Some roads could be fully decommissioned without limiting future management activities in the WAU. Drainages with the high road densities in Riparian Reserves should be considered for road decommissioning opportunities.

Consider determining where culverts block fish passage, need to be repaired or replaced, are inadequate to accommodate a 100-year flood, and additional culverts, waterbars, or waterdips would reduce stream network extension.

Provide adequate buffers on streams and monitor fertilization activities. Apply fertilizer to maintain pH and primary productivity in streams.

Consider the number of acres in the TSZ and the number of acres less than 30 years old when planning regeneration harvests.

Consider using existing roads and minimizing new road construction when planning timber harvesting activities.

Reducing road densities and conducting stream restoration projects would probably be the most effective restoration activities in the WAU. Thinning in Riparian Reserves should be considered where opportunities exist.

Consider opportunities to adjust Riparian Reserve widths within the WAU. The Riparian Reserve Evaluation Techniques and Synthesis Module should be used as a guide when considering adjusting Riparian Reserve widths.

Fisheries

Consider installing instream structures in anadromous fish-bearing stream reaches.

Consider following National Marine Fisheries Service (NMFS) guidance on timber salvaging in riparian areas.

Wildlife

Consider evaluating the timing, spacing, and location of timber harvesting to determine the effects on dispersal and suitable northern spotted owl habitat in the WAU.

Consider continuing peregrine falcon habitat evaluation in the WAU.

Two years of protocol surveys are required prior to implementing projects that modify suitable marbled murrelet habitat.

Consider conducting surveys to determine if northern goshawks are present in the WAU.

Consider gathering information about other raptor species in the WAU.

Consider conducting general surveys for mollusks in the WAU.

Consider scheduling management activities, such as burning, brushing, precommercial or commercial thinning, timber harvesting, or other activities that remove or modify neotropical bird habitat so they do not occur during the breeding season between April 1 and July 30 of any given year.

Consider identifying and protecting historic elk and deer travel corridors and wintering calving areas in the WAU.

I. Characterization of the Watershed

Watershed analysis is a systematic procedure to characterize a watershed. The information would be used for making management decisions to meet ecosystem management objectives. This watershed analysis follows the format presented in the Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis.

Watershed analysis is one component of the Aquatic Conservation Strategy (ACS). The other components of the Aquatic Conservation Strategy are Key Watersheds, Riparian Reserves, and Watershed Restoration. These components are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems. The Middle South Umpqua Watershed Analysis Unit (WAU) is not within a Key Watershed. Riparian Reserves are portions of the landscape where riparian-dependent and stream resources receive primary emphasis. Riparian Reserves help to meet the Aquatic Conservation Strategy by maintaining streambank integrity, large woody debris (LWD), riparian shade and microclimate, and surface and groundwater systems (see Appendix H). Riparian Reserves also provide sediment filtration, travel and dispersal corridors, nutrient sources, pool habitat, and drainage network connections. Watershed Restoration would be based on watershed analysis.

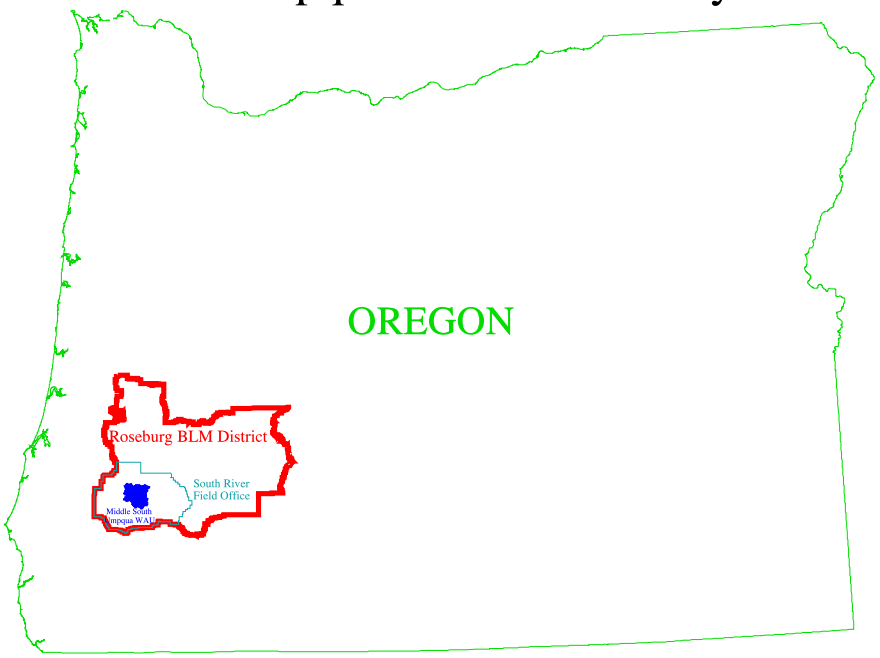
The Middle South Umpqua Watershed Analysis Unit is located in the middle of the South River Resource Area on the Roseburg District Bureau of Land Management (see Map 1). The Watershed Analysis Unit covers approximately 59,397 acres. Elevation ranges from about 517 feet near the town of Dillard to about 3,247 feet near Nickel Mountain in the southwest part of the WAU. The towns of Dillard and Tri City are located in this WAU.

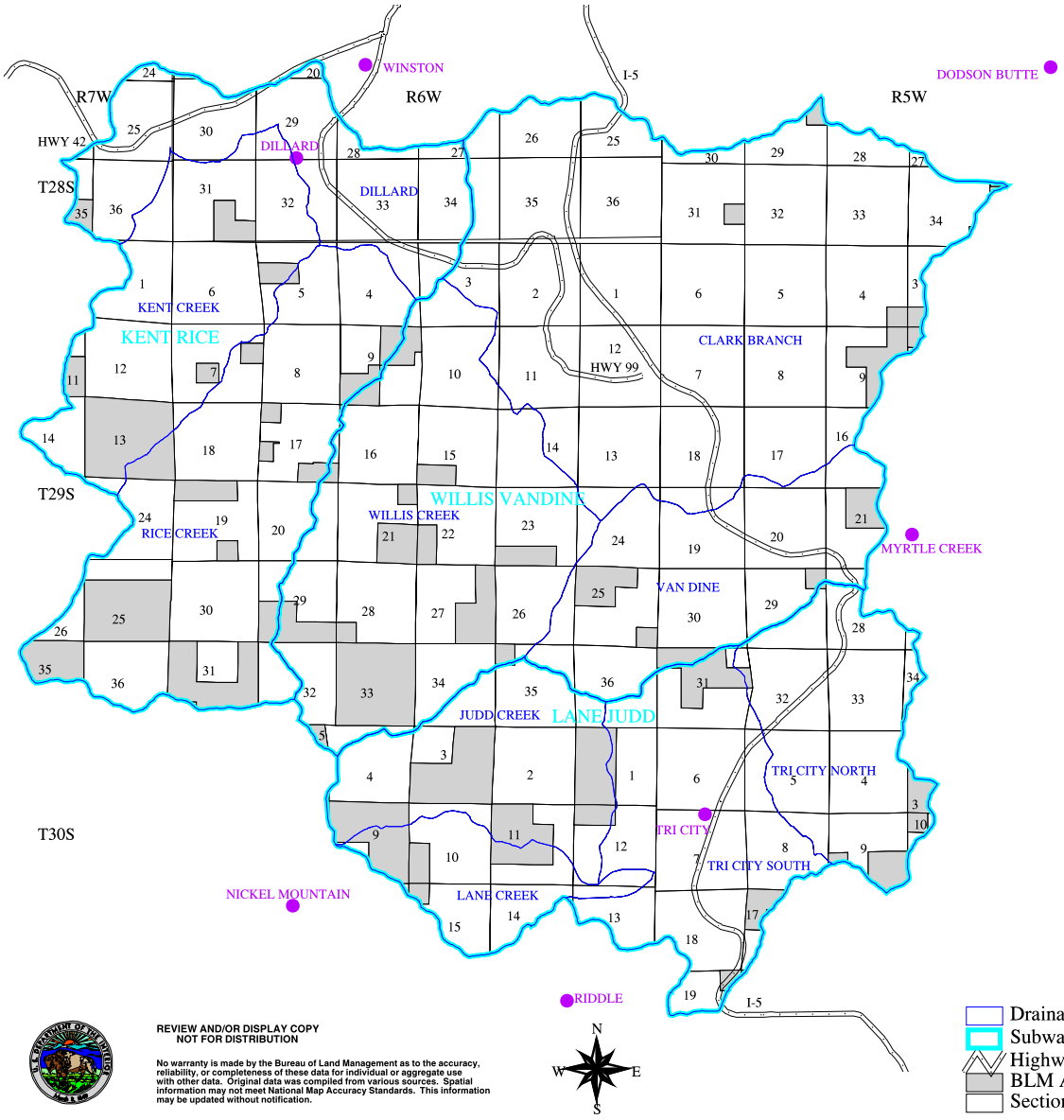
The Middle South Umpqua Watershed Analysis Unit is interchangeable with the Middle South Umpqua Watershed, which is a fifth field watershed. The fifth field watershed is the scale of analysis to be used when determining whether activities retard or prevent attainment of Aquatic Conservation Strategy objectives (USDI 1995). The Middle South Umpqua WAU includes three subwatersheds, which are further divided into ten drainages. The subwatersheds and their drainages are shown on Map 2 and listed in Table 1.

The Bureau of Land Management (BLM) administers approximately 7,682 acres (13 percent) of the Middle South Umpqua WAU. Privately owned lands cover approximately 51,713 acres (87 percent) of the WAU. Approximately 20,734 acres (35 percent) of the WAU is in nonforested conditions, mainly agricultural (17,758 acres, which is 30 percent of the WAU).

Bureau of Land Management administered lands are composed of Matrix and Riparian Reserve Land Use Allocations established in the Northwest Forest Plan (USDA and USDI 1994b) and Roseburg District Resource Management Plan (RMP). Matrix lands are further delineated into General Forest Management Areas (GFMA) and Connectivity/Diversity Blocks (CONN). Map 3 and Chart 1 show the percentage of GFMA, Connectivity/Diversity Blocks, and Riparian and Other Reserves and how they are distributed in the WAU. Table 2 and Chart 2 show the number of acres by Land Use Allocation.

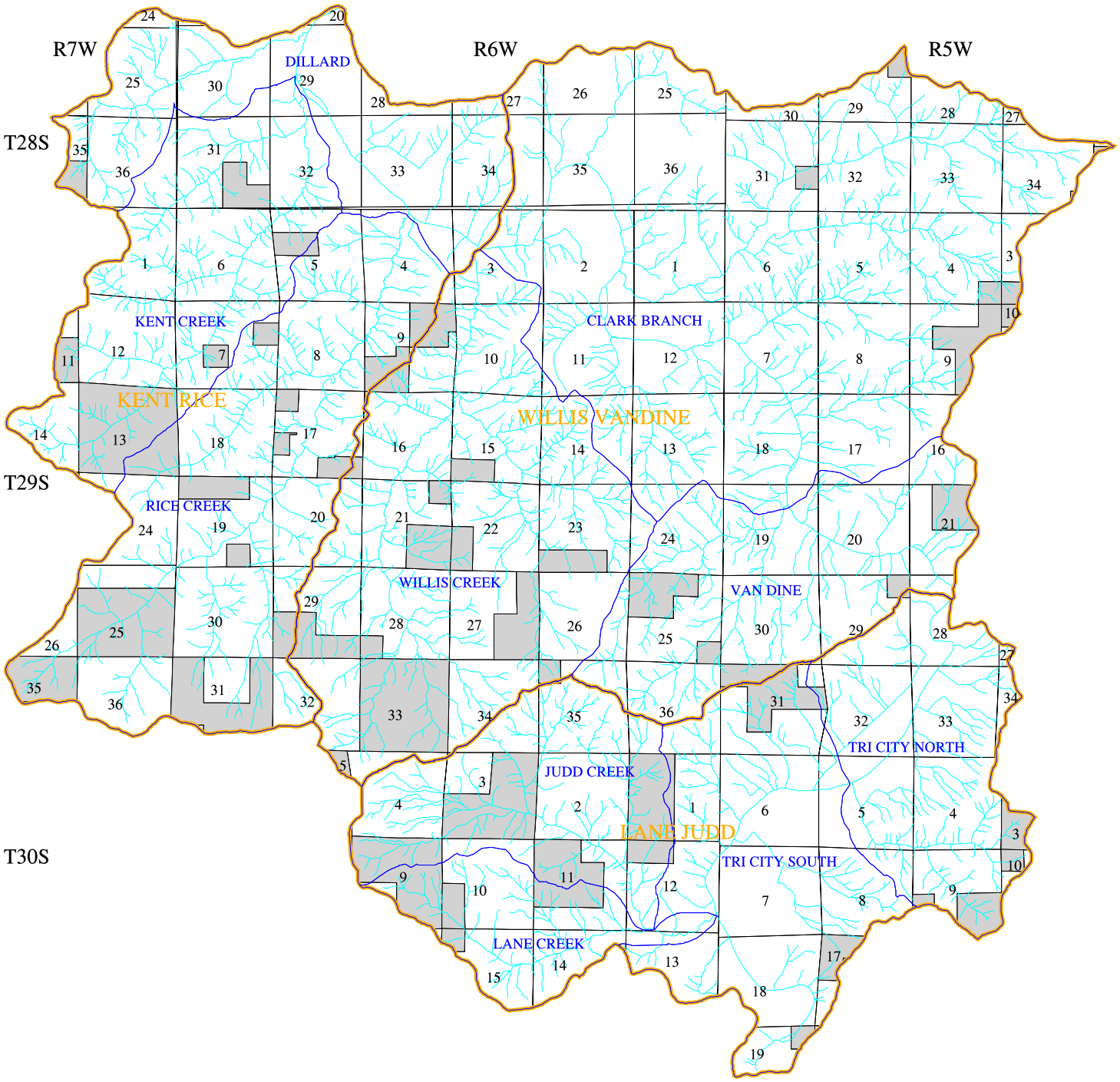
Map 1. Vicinity Map
Middle South Umpqua Watershed Analysis Unit





Drainages
Subwatershed
Highways
BLM Administered Lands
Section Lines

Map 2. Middle South Umpqua Watershed Analysis Unit Subwatersheds and Drainages



0 1 2 3 4 5 Miles

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Drainages
Subwatershed
Streams
BLM Administered Lands
Section Lines

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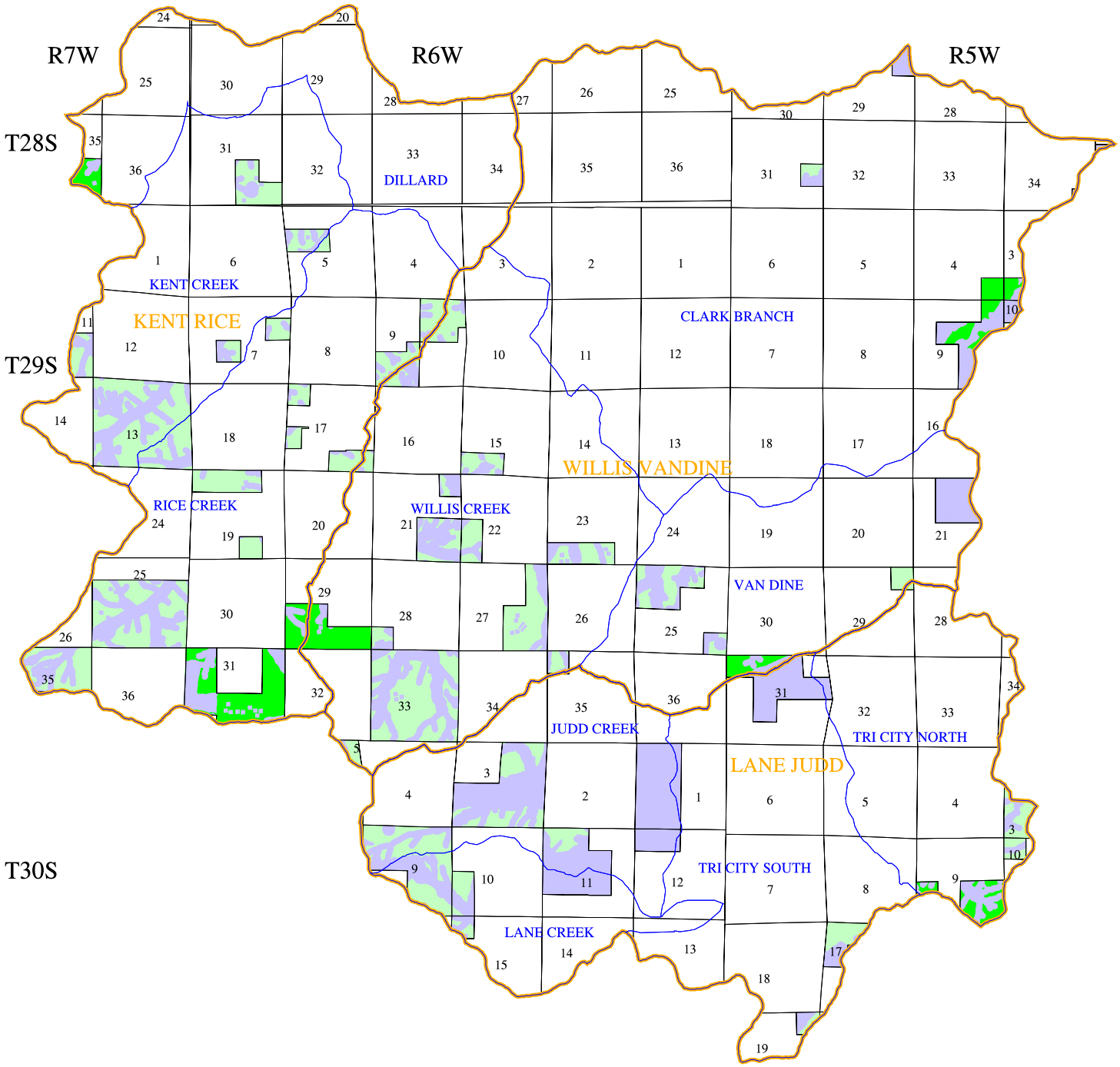
Map 3. Middle South Umpqua Watershed Analysis Unit
Land Use Allocations



0 1 2 3 4 5 Miles

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Drainages
Subwatershed
Section Lines
Riparian and Other Reserves
Land Use Allocations
CONNECTIVITY/DIVERSITY BLOCKS
GFMA

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Table 1. Acres and Percent Ownership by Drainage and Subwatershed.

Drainage **Subwatershed**	BLM		Private		Total Acres
	Acres	Percent	Acres	Percent	
Dillard	61	1	4,008	99	4,070
Kent Creek	848	17	4,073	83	4,921
Rice Creek	1,825	23	6,105	77	7,930
Kent Rice Subwatershed	2,734	16	14,186	84	16,921
Judd Creek	1,237	34	2,426	66	3,663
Lane Creek	450	23	1,490	77	1,940
Tri City North	295	8	3,499	92	3,793
Tri City South	381	8	4,416	92	4,798
Lane Judd Subwatershed	2,363	17	11,831	83	14,194
Clark Branch	370	2	14,549	98	14,919
Van Dine	490	10	4,251	90	4,741
Willis Creek	1,726	20	6,896	80	8,622
Willis Vandine Subwatershed	2,587	9	25,696	91	28,282
Middle South Umpqua WAU	7,682	13	51,713	87	59,397

Chart 1. Middle South Umpqua WAU

Total Land Use in the WAU

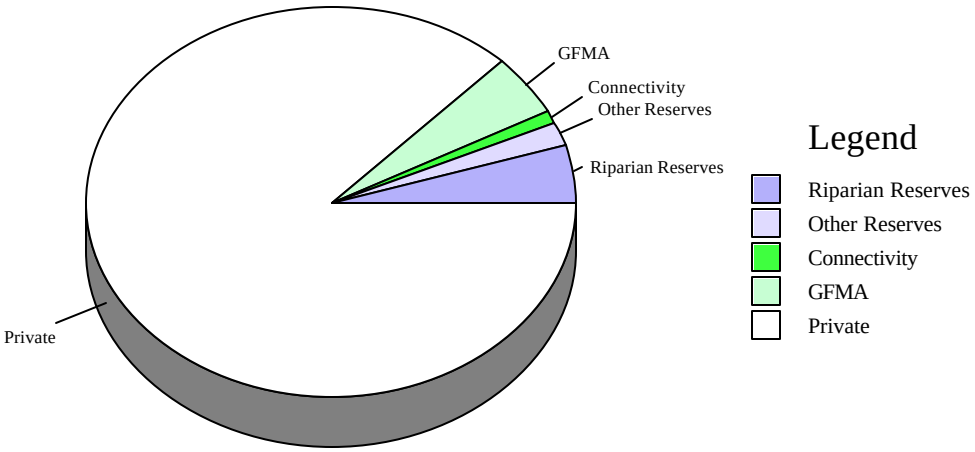
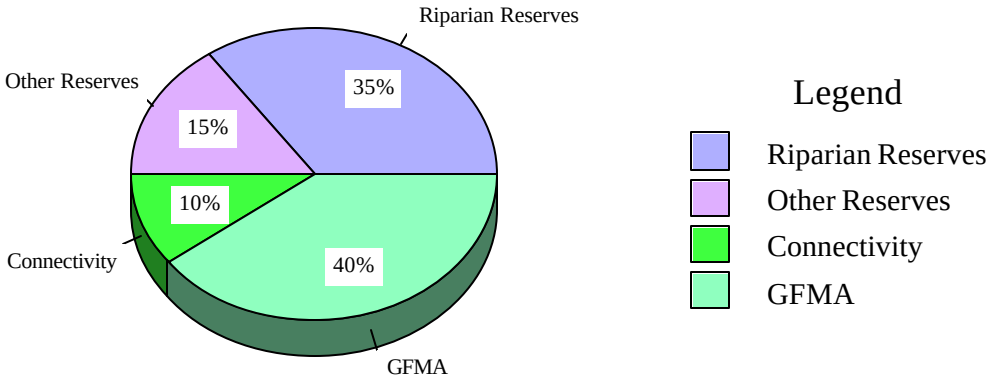


Table 2. Acres and Percentage of BLM Managed Lands by Land Use Allocation.

Land Use Allocation	Acres of BLM Managed Lands	Percent of BLM Managed Lands	Percent of Watershed Analysis Unit
Riparian Reserves	2,698	35	5
Other Reserved Areas (Owl Core Areas and TPCC Withdrawn Areas)	1,159	15	2
Connectivity/Diversity Blocks	752	10	1
General Forest Management Areas (GFMA)	3,076	40	5
Total	7,682	100	13

Chart 2. Middle South Umpqua WAU

BLM Land Use Allocations



II. Issues and Key Questions

The purpose of developing issues is to focus the analysis on the key elements of the ecosystem that are relevant to the management questions, human values, or resource conditions within the WAU. Areas covered by this watershed analysis receive more in-depth analysis during project development and the National Environmental Policy Act (NEPA) process. New information gathered during the Interdisciplinary (ID) team process would be appended to the watershed analysis document as an update.

A. ISSUE 1 - Harvest Potential

Matrix lands are responsible for contributing to the Probable Sale Quantity (PSQ). Objectives in the Matrix include producing a sustainable supply of timber and other forest commodities, providing connectivity (along with other Land Use Allocations, such as Riparian Reserves) between Late-Successional Reserves, providing habitat for a variety of organisms associated with both late-successional and younger forests, providing for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, maintenance of ecologically valuable structural components such as down logs, snags, and large trees, and providing early-successional habitat.

Key Questions

Vegetation Patterns

What are the historic and current vegetation conditions? See pages 15 through 39.

Where are the stands of commercially harvestable age (at least 40 years old) within the Matrix? See Map 7 on page 22, Map 13 on page 44, and Map I-1 in Appendix I.

Can the scale, timing, and spacing of timber harvest areas be adjusted to optimize conditions for other resources while meeting the objectives for Matrix lands established in the SEIS ROD and the Roseburg District RMP? See pages 40 through 46, Map 12 on page 40, and Appendix I.

B. ISSUE 2 - Watershed Health and Restoration

Watershed restoration is an integral part of a program to aid recovery of fish habitat, riparian habitat, and water quality. One component of a watershed restoration program involves road treatments (such as decommissioning or upgrading), which would reduce sedimentation and erosion and improve water quality. A second component deals with riparian vegetation. Silvicultural treatments in Riparian Reserves, such as planting unstable areas along streams, thinning densely-stocked young stands, releasing young conifers overtopped by hardwoods, and reforesting shrub and hardwood dominated stands with conifers, would improve bank stabilization, increase shade, and accelerate recruitment of large wood desirable for future in-stream structure. A third watershed restoration component involves the design and placement of in-

stream habitat structure in an effort to increase channel complexity and the number of pools. Other restoration opportunities may include mine reclamation or meadow or wetland restoration.

Opportunities may exist to promote the long-term health on lands outside of the riparian areas. Management activities would be designed so forests remain productive, resilient, and stable over time to withstand the effects of periodic natural or human-caused stresses such as drought, insect attack, disease, climatic changes, flood, resource management practices, and resource demands.

Key Questions

a. Vegetation Patterns

What are the historic and current vegetation conditions in the WAU? See pages 15 through 39.

What processes created the vegetation patterns in the WAU? See page 15, pages 18 through 20, and page 37.

What is the age class distribution in the WAU? Where are the early and mid seral stands in the WAU? Where are the late-successional/old-growth stands within the WAU? See Table 5 on page 23, Table 6 on page 24, Map 6 on page 21, and Map 7 on page 22.

What is the current condition of Riparian Reserves within the WAU? See Table 7 on page 33, Table 13 on page 42, Map 10 on page 33, and pages 85, 86, and 100.

b. Insects and Diseases

What insects and diseases of silvicultural concern occur in the WAU? See pages 27 through 30.

What is the management strategy for controlling insects and diseases of concern? See pages 27 through 30 and pages 42,43, and 105.

c. Soils / Erosion

What are the dominant soil management concerns in the WAU and where do they occur? See pages 49 through 57, Map 15 on page 51, and Map 16 on page 55.

d. Hydrology / Channel Processes

What are the dominant hydrologic characteristics (e.g. total discharge, and peak, base, and low flows) and other notable hydrologic features (e.g. channel geomorphology and Rosgen stream classification) and processes in the WAU? See pages 63 through 70.

e. Water Quality

What beneficial uses dependant on aquatic resources occur in the WAU and which water quality parameters are critical to these uses? See pages 70 through 75.

What are the effects of management activities on hydrologic processes? See pages 62 through 70 and page 76.

Where are the opportunities to improve water quality and hydrologic conditions? See pages 105 and 106 and Appendix G.

f. Fisheries

Where are the historic and current locations of fish populations? See pages 77 through 83.

How have fish habitat and populations been affected by hydrologic processes and human activities? See pages 77 through 86.

What and where are the restoration opportunities that would benefit the fisheries resource? See pages 107 and 108.

g. Roads

What are the current conditions and distribution of roads in the WAU? See pages 63 through 65.

How are roads impacting other resources within the WAU? See pages 106 through 108.

Are there road decommissioning or improvement opportunities in the WAU? See pages 66, 107, and 108 and Appendix G.

C. ISSUE 3 - Special Status Species

Key Questions

Special Status Species and Their Habitat

What are the species of concern important in the WAU (e.g. threatened or endangered species, special status species, or species emphasized in other plans)? See pages 87 through 98, pages 101 through 103, Table E-1 in Appendix E, and Table F-1 in Appendix F.

What is the distribution and character of special status species habitat? See pages 87 through 103, Map 19 on page 88, Map 20 on page 92, and Map 21 on page 96.

III. Human Uses

A. Reference Conditions

The area included in the Middle South Umpqua Watershed Analysis Unit has been used by humans for probably thousands of years. Uses of the WAU have included hunting and gathering, subsistence and commercial agriculture, transportation, logging and lumbering, service-related activities, residential dwellings, and recreation.

Little knowledge exists of prehistoric use in the WAU prior to European-American settlement. The indigenous people of the area followed a seasonal life hunting deer and elk, and gathering nuts, berries, seeds, and roots. A small Indian village was located on Rice Creek in the late 1880s (Clayton 1956). No prehistoric sites have been documented occurring on BLM-administered land. Three recorded archaeological sites occur on private land in the South Umpqua River Valley. The lack of prehistoric evidence in the WAU may be the majority of the sites located on private land have been disturbed by settlement and farming.

1. Exploration and Settlement

The 1800s marked the arrival of fur trappers and settlers into the South Umpqua River Valley. The passage of the Donation Land Claim Act in 1850 opened the region to settlers. Settlers transformed the life and countryside of the area and began the process of shaping it into its current conditions. The primary period of settlement in the WAU was between 1850 and 1900. The early settlers established homesites in the meadows along Missouri Bottom, Willis Creek, Rice Creek, and Kent Creek.

Rice Creek was originally named Crystal Creek because it was so bright and clear. The name was changed later to reflect the earliest setters along the creek. Fish and game were plentiful for the early settlers. "Fish in Rice Creek in those days were as thick as shakes on a large stock barn" (Clayton 1956). When the Rice family first moved to the area the "boys killed lots of deer the first year" (Clayton 1956).

The early settlers maintained a subsistence lifestyle until a market was established for grain and livestock. These became the main sources of income throughout the 1880s and 1890s. The hop industry was very profitable in the 1880s for the Kents on Kent Creek (Clayton 1957). By 1883, a rail line was constructed to Dillard, opening a new avenue of transportation to the north and the possibility of new markets.

2. Transportation

The Middle South Umpqua Watershed Analysis Unit was a transportation corridor before the earliest explorers. The earliest settlers traveled along the Applegate Trail through the area to the Willamette River Valley. Beginning in 1861, a stage line connecting Portland and San Francisco began transporting goods and people. As the population of Oregon increased, the state highway was built through the area. The

highway was improved to become Interstate 5, which provided efficient transportation from Canada to Mexico.

After World War II, private timber companies and the BLM built roads into their timberlands. Improvements to the transportation system allowed faster transportation of commodities. The State highway system was greatly improved during this time allowing a wider distribution of timber and agricultural products, an increase in travelers, and people to commute to work from greater distances.

3. Timber/Logging

Cadastral survey notes from the mid-nineteenth century indicate the vegetation in the WAU consisted of grasslands on the valley floor, oak openings on the middle of the hill slopes, and timber on the upper hill slopes.

The first sawmill was built on Kent Creek in 1888 (Clayton 1956). Another mill was built on Rice Creek in 1917 (Beckham 1986). The Roseburg Forest Products mill near the community of Dillard was the world's largest wood manufacturing plant in the 1970s. Increased demands for lumber to build houses and improvements in transportation allowed lumber production to increase markedly.

B. Current Conditions

The dominant human uses in the Middle South Umpqua Watershed Analysis Unit have been agriculture, timber production, transportation, and service-related activities. Service-related activities include providing food, gas, and other essential products for tourists, commercial travelers, and local residents. There are no treaty rights or tribal uses in the WAU, although individual tribal members may utilize the area.

1. Timber

Timber harvesting has had a major influence on the WAU. Both private and BLM-administered land contributed to the timber harvesting and lumber production over the last 45 years. Timber harvesting is a major human use of BLM-administered lands in the WAU. Timber harvesting on private land will probably continue to be driven by market conditions.

One concern that may affect management and timber harvesting on BLM-administered lands is the lack of access to some BLM-administered lands through surrounding properties. Acquisition of easements may be necessary to access some parcels of BLM-administered land in the WAU.

2. Special Forest Products

Another commercial use of forests in the WAU is the collection of Special Forest Products. Cedar boughs, greenery, and firewood were the main Special Forest Products collected in the South River Resource Area

in 1999. Special Forest Product sale prices are strongly influenced by product quality, which varies by product and the local area. Salvaging dead and down trees for sawtimber near roads has had the most effect from Special Forest Products. Areas where salvaging sawtimber has occurred often contain less large woody debris. Management direction in the RMP provides guidelines for the salvaging of sawtimber.

3. Agriculture/Grazing

Agriculture was the basis for early settlement of the area. A variety of grain and fruit crops were important in the past. Livestock, principally sheep and cattle, and hay are the primary agricultural products now. Agricultural production in the lower elevations of the WAU will probably continue to be influenced by local and regional demands for commodities.

4. Recreation

Recreation use in the Middle South Umpqua Watershed Analysis Unit is determined by the land ownership, topography, forest types, and age classes in the area. No developed recreation sites occur on BLM-administered land in the WAU at this time. Special Use Permits are not required for recreation use in the WAU.

The Recreation Opportunity Spectrum (ROS) considers the vast majority of the Federally-administered land in the WAU to be Roaded Natural. The South Umpqua River Valley in the WAU has a strong Rural setting. However, the BLM manages a limited amount of land in this area. The areas containing BLM-administered lands are characterized by predominantly natural appearing environments with moderate evidence of the sights and sounds of man. Resource modification and utilization practices are evident but usually blend with the natural environment. Interaction between users may be low to moderate but with evidence of other users prevalent. Rustic facilities are provided for user convenience as well as for safety and resource protection. Facilities are designed and constructed to provide for conventional motorized use.

a. Off Highway Vehicles (OHV)

The predominant OHV designation the RMP for the Middle South Umpqua WAU is 'Limited' to existing roads and trails. Under this designation, existing roads and trails are open to motorized access unless otherwise identified (e.g. hiking trails). Licensed vehicles may use maintained roads and natural surface roads and trails. Registered OHVs, such as All Terrain Vehicles (ATV) and motorcycles, not licensed for the public roads may only use existing roads and trails that are not maintained (graveled).

New roads and trails may be approved and constructed in limited areas, through the NEPA process. State funds from gas taxes and registrations may be available to the BLM to develop OHV areas. If problems occur within road and trail systems, they may be closed on an emergency basis through 43 CFR 8341 and 8364.

b. Visual Resource Management (VRM)

Visual Resource Management classes are assigned through an inventory system and range from Class I through IV. Class I lands are reserved for their scenic quality and allow for very limited management. Class IV lands allow for major modifications to the existing character of the landscape. These classes are defined based on the combination of scenic quality, sensitivity level, and distance zones.

The WAU contains VRM Class II, Class III, and Class IV lands. Under the Class II designation, low levels of change to the characteristics of the landscape would be allowed. Management on Class III lands would partially retain the visual character. A Class IV designation allows major modifications. Class II and Class III lands occur along the Interstate 5 corridor. The remainder of the WAU is designated as Class IV.

Management direction within Class II lands stresses a light touch by using, such as single tree selection, uneven aged harvest, retention of shelterwood overstory trees, or group selection timber harvesting methods. Regeneration harvests are not to exceed 6.6 percent of the land base per decade in visible areas of the Class II land.

Management within Class III lands would employ short term retention of shelterwood overstory trees or regeneration harvests which have less than ten acres of seen area. No more than ten percent of the seen Class III would be harvested within any decade. Regeneration harvest units would be screened from key viewing points along major travel routes.

Under the Class IV designation, the extent of change to the character of the landscape can be high. Management activities may dominate the view and may be the major focus of the viewer's attention. However, every attempt should be made to minimize the impact of activities through careful unit location, minimal disturbance, and repetition of the basic elements of form, line, and texture.

c. Recreation Management

The WAU falls within the South River Extensive Recreation Management Area (ERMA). Within the ERMA, recreation is mainly unstructured and dispersed, where limited needs or responsibilities require minimal recreation investments. The ERMA which constitutes the bulk of the public land, gives recreation visitors the freedom of choice with minimal regulatory constraints.

Forms of recreation commonly observed in the Middle South Umpqua WAU include driving for pleasure, hunting, photography, picnicking, camping, shooting or target practice, and gathering (berries, flowers, mushrooms, greenery, and rocks). Areas along major roads and larger streams are common sites for these various forms of recreation.

IV. Vegetation

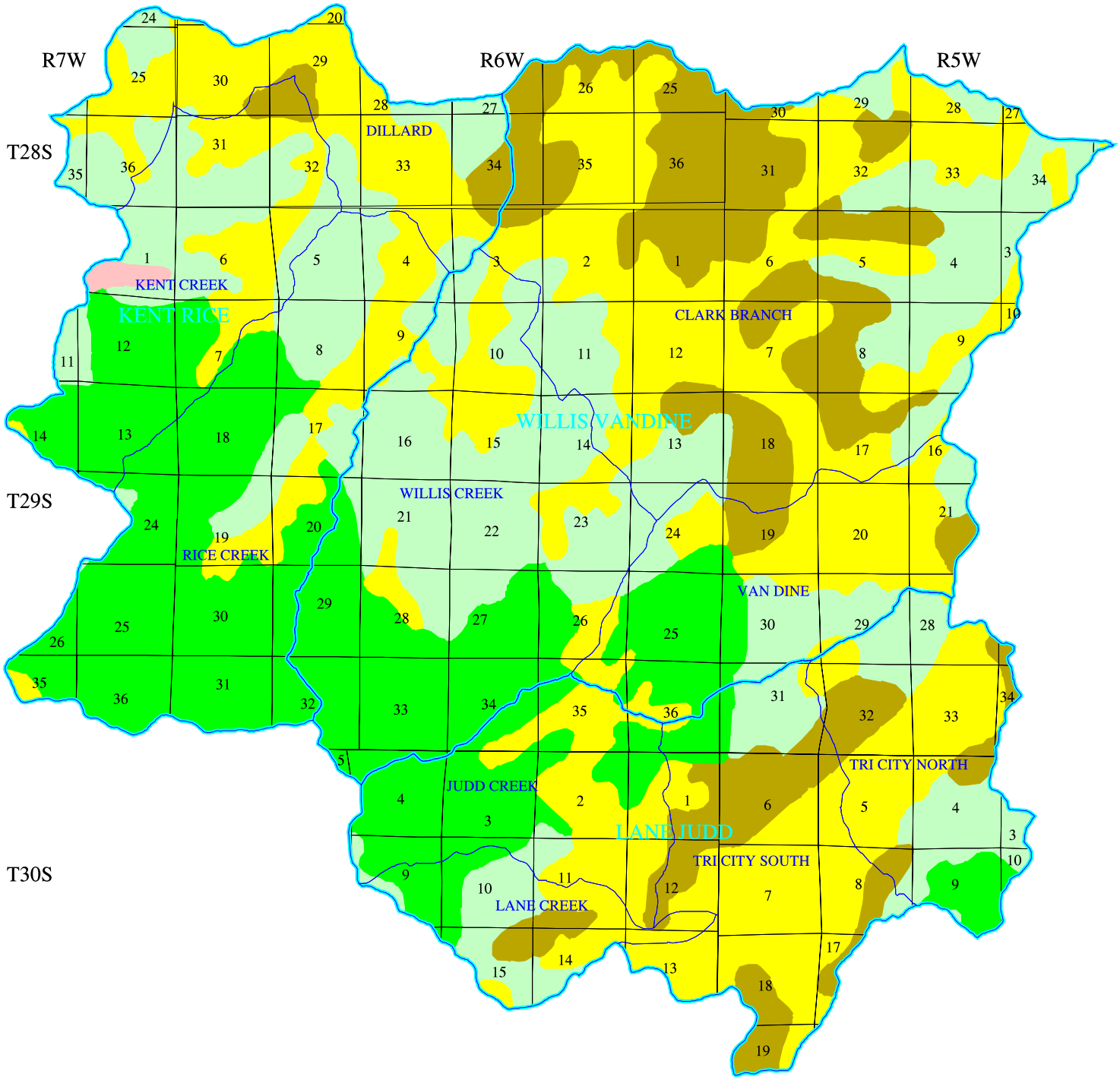
A. Reference Conditions

The WAU is located in the Klamath and Oregon Coast Range Physiographic Province (Franklin and Dyrness 1984). The topography in the WAU consists of low foothills with wide, flat valleys created by the South Umpqua River in the northern and eastern portions of the WAU. Climax vegetation is characterized by Douglas-fir and conifer-hardwood temperate forest types (Franklin and Dyrness 1984). Vegetative communities reflect the differences between the wetter Coast Range and the drier Klamath physiographic provinces.

The reference condition being used for the Middle South Umpqua WAU is 1936 vegetation types. A map in the Roseburg BLM District Geographic Information System (GIS) contains general forest type descriptions of vegetation in terms of diameter class and species (see Table 3 and Map 4). Table 4 compares the percentage of the WAU in three different seral stages of forest vegetation and non-forested areas for 1936 and 1993. The most current data for the entire WAU was derived from satellite imagery from 1993.

In 1936, the early and mid seral stages were located between the agricultural lands and late seral forests. The early seral stand was the result of a fire. The mid seral stands may have developed after fires or timber harvesting. The late seral forests generally occurred in large blocks. An estimated 49 to 68 percent of the forests in the Oregon Coast Range in the late 1850s to the early 1900s were comprised of late seral stands (Teensma et al. 1991). The 1936 information shows the Middle South Umpqua WAU had less late seral stands than was considered typical for the Oregon Coast Range.

Map 4. Middle South Umpqua Watershed Analysis Unit
1936 Age Class Distribution



0 1 2 3 4 5 Miles

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Drainages
Subwatershed
Section Lines
1936 Age Classes
Greater Than 80 Years Old (Late Seral)
30 to 80 Years Old (Mid Seral)
Less Than 30 Years Old (Early Seral)
Hardwoods
Agricultural Land

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Table 3. 1936 Age Class Distribution in the Middle South Umpqua WAU.

	Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (31 to 80 Years Old)		Late Seral (80 + Years Old)		Hardwoods		
Area	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Total Acres
Dillard	2,514	62	0	0	1,293	32	0	0	263	6	4,070
Kent Creek	1,160	24	145	3	1,788	36	1,677	34	151	3	4,921
Rice Creek	1,287	16	0	0	1,606	20	5,037	64	0	0	7,930
Kent Rice Subwatershed	4,961	29	145	1	4,687	28	6,714	40	414	2	16,921
Judd Creek	1,460	40	0	0	166	5	1,974	54	63	2	3,663
Lane Creek	568	29	0	0	716	37	406	21	250	13	1,940
Tri City North	1,574	41	0	0	1,248	33	368	9.7	603	16	3,793
Tri City South	2,578	54	0	0	491	10	274	5.7	1,455	30	4,798
Lane Judd Subwatershed	6,180	44	0	0	2,621	18	3,022	21	2,371	17	14,194
Clark Branch	6,275	42	0	0	3,671	25	0	0	4,973	33	14,919
Van Dine	2,072	44	0	0	1,086	23	1,278	27	305	6	4,741
Willis Creek	1,451	17	0	0	4,094	47	3,077	36	0	0	8,622
Willis Vandine Subwatershed	9,798	35	0	0	8,851	31	4,355	15	5,278	19	28,282
Middle South Umpqua WAU	20,939	35	145	0	16,159	27	14,091	24	8,063	14	59,397

Table 4. Comparison of Seral Stage Percentages Between 1936 and 1993 in the Middle South Umpqua WAU.

Seral Stage	1936		1993	
Early	Burned, Cut <1920	0%	0-30 years	40%
Mid	6-20"	27%	30-80 years	12%
Late	20-40", >22"	24%	>80 years	13%
Non-forest	Non-forest and Hardwoods	49%	Non-forest	35%

1. Fire History and Natural Fire Regimes

Fire has been an important disturbance factor in Pacific Northwest forests for thousands of years. The "unmanaged" or "natural" forests, those that developed before widespread logging or fire protection existed, were initiated by fire and most have been altered by fire since establishment. Early accounts suggest that fires were highly variable occurring frequently or infrequently and killed all of the trees at times or left the mature trees unscathed (Agee 1990).

Fire regimes of the Pacific Northwest have been described by Agee (1981). Fire regimes are broad, artificially grouped categories, which overlap considerably with one another. Forests are considered to have a similar fire regime when fires occur with similar frequency, severity, and extent. Effects of forest fires can be more precisely described if forest types can be grouped by fire regimes. The Middle South Umpqua Watershed Analysis Unit is considered to have a high-severity fire regime. High-severity fire regimes typically occur in cool, moist forest types. In high-severity fire regimes, fires are infrequent (generally more than 100 years between fires) and occur under unusual conditions, such as during droughts, during east wind weather events (hot and dry foehn winds), and with an ignition source such as lightning. Fires are often of short duration (lasting from days to weeks) but of high intensity and severity (Pickford et al. 1980). Most of the lands on the Roseburg BLM District are classified as being in a high-severity fire regime. High-severity fire regimes are common in the Oregon coastal mountains, the middle to northern Cascades, the Olympic Mountains, and other typical westside forests.

Other fire regimes exist within the Middle South Umpqua WAU. Lower elevations have more open, grass covered forest types which transition to western hemlock/Douglas-fir forests. The transition occurs with changes in aspect and elevation.

Accurate fire return intervals have not been calculated in Pacific Northwest forests because the intervals between fires are long and may not be cyclic (Agee and Flewelling 1983). On drier sites, such forest may burn every 100 to 200 years. Fahnestock and Agee (1983) estimated the regional average to be 230 years. Douglas-fir begins to be replaced by the more shade tolerant western hemlock at approximately 250 years of age and continues until the stand is about 700 to 1000 years old when western hemlock dominates the stand. The cycle from Douglas-fir to western hemlock is rarely completed because fires which create stand openings allowing Douglas-fir to regenerate, usually occur before the Douglas-fir disappears from the stand (Agee 1981).

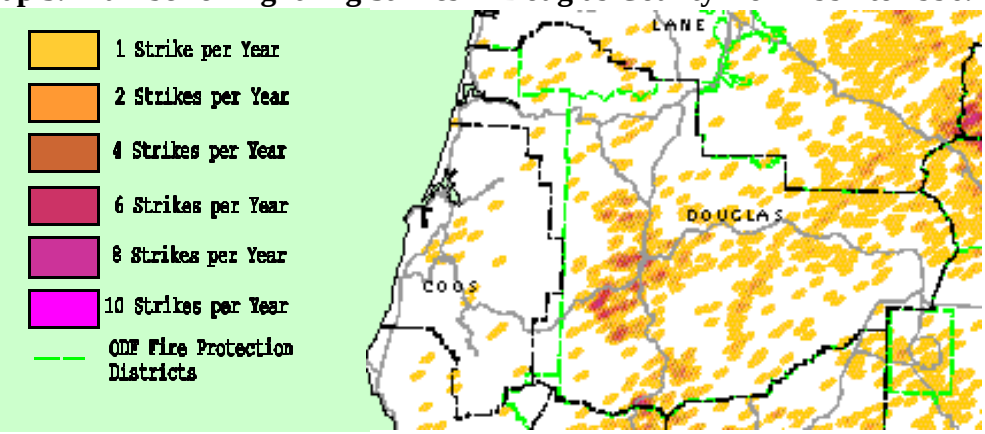
Fire suppression during the past 75 years has been successful at minimizing the number of acres burned by wildfires. During this same period, prescribed fire has been used extensively. The pattern of prescribed fire use has evolved in the last 50 years. Originally, prescribed fire was used almost exclusively for reducing fire hazards. More recently the emphasis has shifted to using prescribed fire for site preparation prior to reforestation (Norris 1990).

2. Recent Fire History

Lightning is the primary natural source of forest fires in the world. The Pacific Northwest has relatively mild thunderstorm activity compared to the southeastern United States. Although, the average annual number of lightning fires is greater in the West because less precipitation accompanies the thunderstorms (Agee 1993). Considerable variation in thunderstorm tracking patterns exists from year to year and from storm to storm. Some thunderstorms are widespread and others consist of localized events (Morris 1934). The lightning strike frequency map (Map 5) shows less than one lightning strike per year occurred over most of the Roseburg BLM District between 1992 and 1996. This map graphically displays the widespread and random distribution of lightning across Douglas County but gives no indication which lightning strikes may have ignited wildfires.

Nineteen eighty-seven was the most severe fire year in the last 50 years and one of the two worst in the last 120 years. However, the number of acres burned in 1987 was only 30 percent of the average number of acres historically burned by wildfire in Oregon. Modern fire suppression and fire management strategies have had a profound effect on natural fire frequency, intensity, species composition, vegetative density, and forest structure in many Pacific Northwest forests (Norris 1990). From 1980 to 1992, seven fires burned approximately 458 acres within the Middle South Umpqua WAU. Most of the fires were caused by lightning burning approximately one acre. The human caused fires burned approximately 457 acres.

Map 5. Number of Lightning Strikes in Douglas County from 1992 to 1996.



The combined effects of fire suppression, timber harvesting followed by prescribed burning, and occasional wildfires have shaped the Middle South Umpqua WAU. Discussing these forests in terms of natural fire regime helps explain why species composition and forest density has changed with human management dating back thousands of years when native Indians set fires as a means of improving areas for foraging. In many forests of the West, years of successful fire suppression have created unnatural fuel accumulations causing fires to be more destructive, burning with greater intensity and in fire regimes where stand replacement fires would rarely occur in a "natural" forest. Forest health has declined in many areas because

fire has been excluded. Fire suppression has probably had little or no effect on fuel accumulation in the forests west of the Cascade Mountains, where the natural fire regime has a long return interval (with the exception of southwest Oregon where the fire return interval is shorter) (Norris 1990).

B. Current Vegetation Conditions

A comparison between the 1936 and 1993 vegetation maps (see Maps 4 and 6) shows how the seral stage spatial distribution has changed. The two maps cannot be compared directly because of the way the data are grouped.

The main causes for the difference between the vegetation conditions in 1936 and 1993 are land ownership, fire suppression, timber harvesting, and to a lesser degree, natural disturbances. Timber harvesting, which began in the late 1940s, was a major factor providing the early seral vegetative structure and pattern that currently exists. Historically, the early seral stage component developed after natural disturbances, primarily stand replacing fires that occurred on small portions of the landscape.

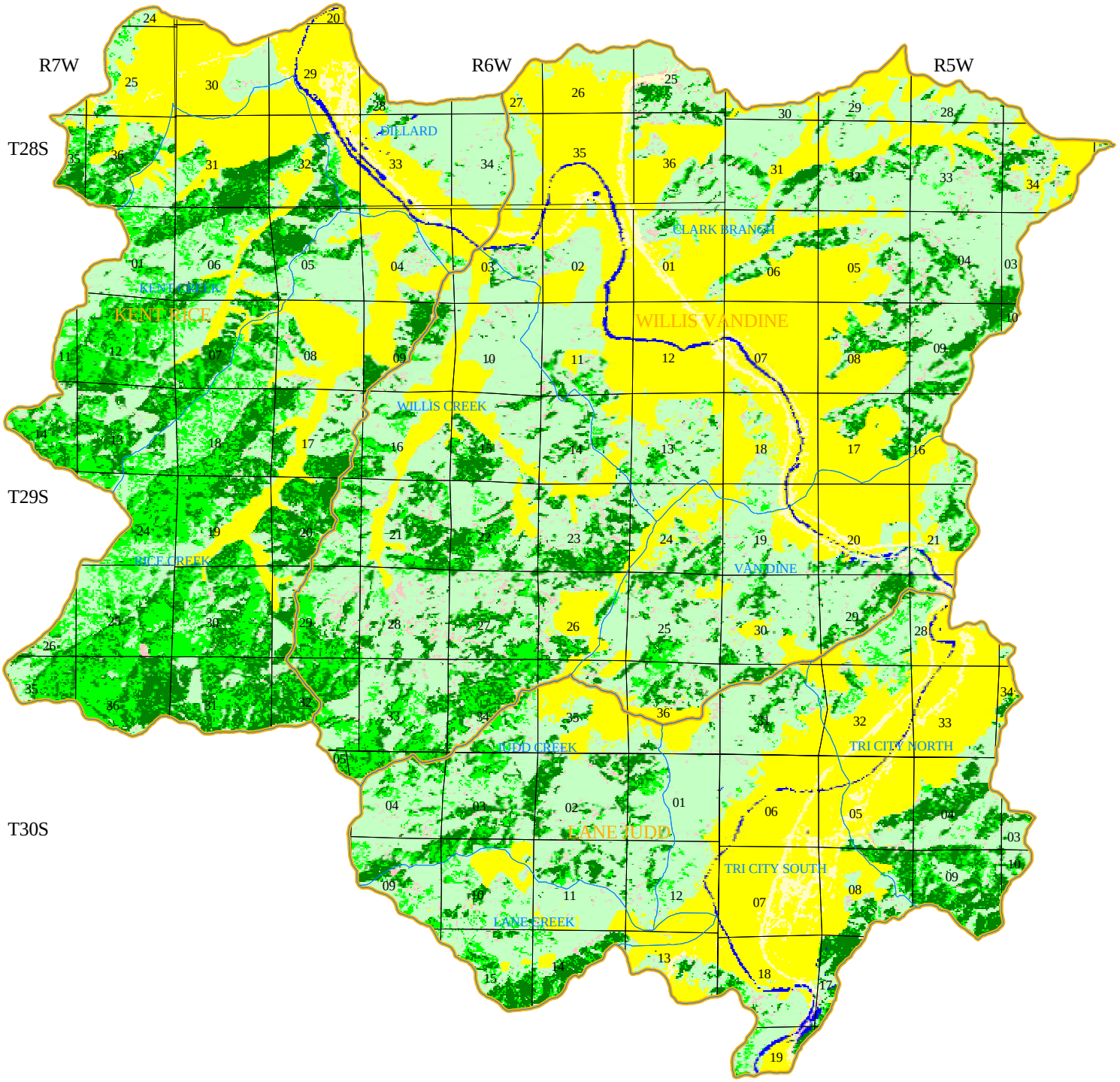
There is great diversity of seral stages, plant communities, and landscape patterns within the Middle South Umpqua Watershed Analysis Unit. For this watershed analysis, 1999 vegetation conditions on BLM-administered land is described by the age of the dominant conifer cover for each stand (see Map 7 and Table 5). Agricultural uses, Christmas tree farms, and valley oak stands occur in the WAU. In the surrounding forested lands, structural classes ranging from establishment (early seral) to late seral are represented (see Table 6 and Map 6).

1. Vegetative Characterization

Vegetation zones of the Middle South Umpqua Watershed Analysis Unit were characterized from the Natural Resources Conservation Service Soil Survey report by Gene Hickman (1994). Vegetation zones may cover large geographical areas, but always have a single set of potential native plant communities repeated throughout the zone. The patterns are predictable since they are related to local landscape features such as aspect, soil, and landform. Microclimate would be relatively similar throughout a given zone. Vegetation zones give an approximate guide to complex local vegetation patterns, natural plant succession, and stand development processes. A wide variety of soils and related geologic features directly affect local plant distribution and the resulting plant communities.

Two vegetative zones are identified within the Middle South Umpqua Watershed Analysis Unit (see Map 8). The Interior Valley and Foothills Zone covers the majority of the WAU. The Grand Fir Zone makes up a small part in the western portion of the WAU.

Map 6. Middle South Umpqua Watershed Analysis Unit
1993 Age Class Distribution



Drainages
Subwatershed
Section Lines

Age Classes
Barren
0 to 30 Years Old (Early Seral)
30 to 80 Years Old (Mid Seral)
Greater Than 80 Years Old (Late Seral)
Water
Agricultural Land
Urban

0 1 2 3 4 5 Miles

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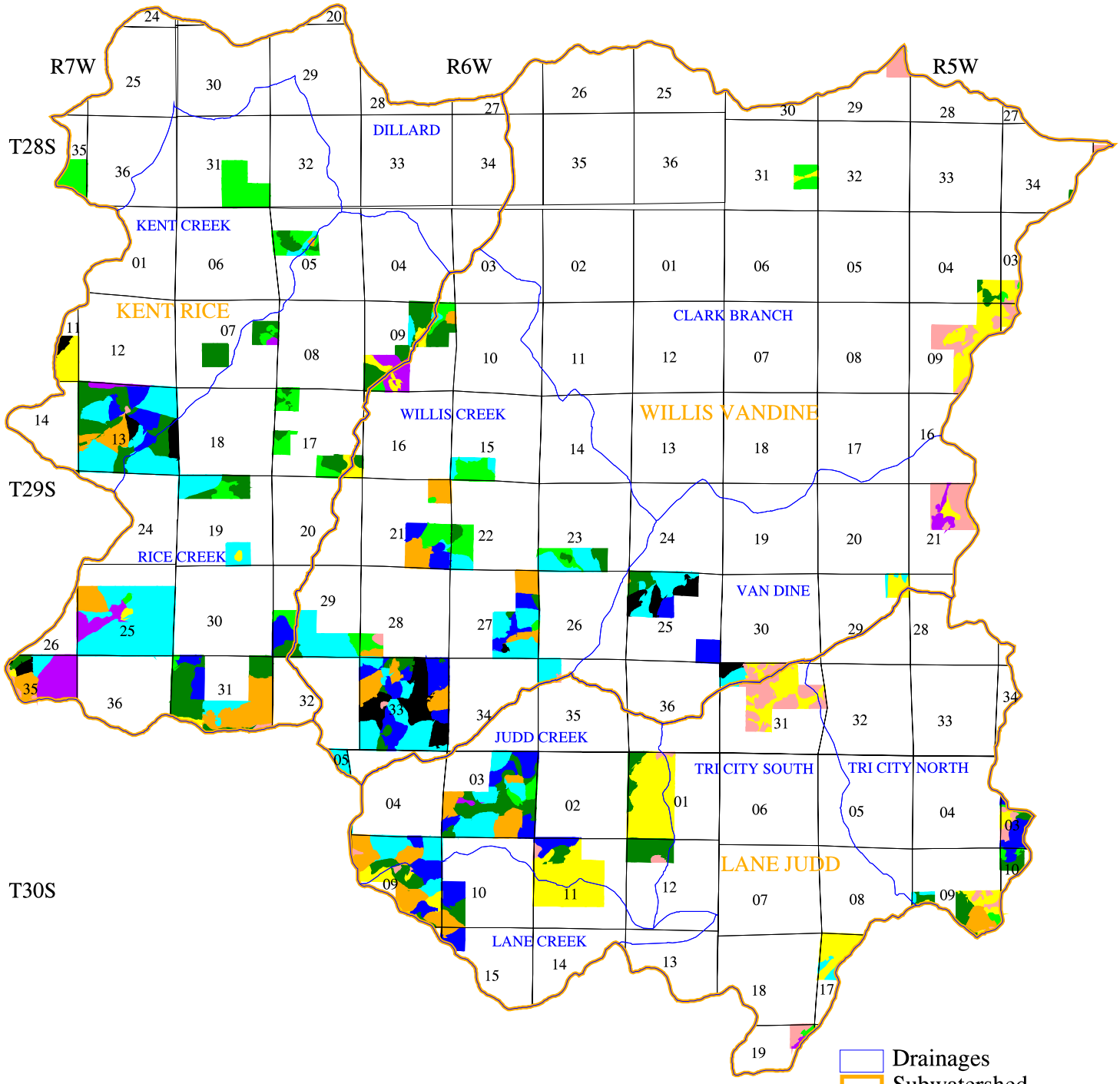
Map 7. Middle South Umpqua Watershed Analysis Unit
1999 BLM Age Class Distribution



0 1 2 3 4 5 Miles

1:102497

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Table 5. 1999 BLM Age Class Distribution.

	Number of Acres by Age Class and Percent of Total																		
AREA	Nonforest	%	0 to 10	%	10 to 20	%	20 to 30	%	30 to 50	%	50 to 80	%	80 to 120	%	120 to 200	%	200 +	%	TOTAL
Dillard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61	100	0	0	61
Kent Creek	4	0	91	11	28	3	67	8	206	24	16	2	64	8	155	18	216	26	847
Rice Creek	17	1	86	5	48	3	241	13	633	35	198	11	45	2	138	8	419	23	1,825
Kent Rice Subwatershed	21	1	177	6	76	3	308	11	839	31	214	8	109	4	354	13	635	23	2,733
Judd Creek	21	2	142	11	0	0	172	14	226	18	6	0	383	31	24	2	263	21	1,237
Lane Creek	6	1	118	26	0	0	87	19	20	4	0	0	159	35	0	0	59	13	449
Tri City North	43	15	54	18	0	0	42	14	7	2	0	0	58	20	19	6	72	24	295
Tri City South	132	35	0	0	0	0	0	0	15	4	6	2	216	57	7	2	5	1	381
Lane Judd Subwatershed	202	9	314	13	0	0	301	13	268	11	12	1	816	35	50	2	399	17	2,362
Clark Branch	127	34	0	0	0	0	0	0	0	0	0	0	188	51	39	11	17	5	371
Van Dine	123	25	58	12	81	17	2	0	106	22	27	6	60	12	0	0	32	7	489
Willis Creek	14	1	255	15	193	11	249	14	571	33	37	2	29	2	251	15	126	7	1,725
Willis Vandine Subwatershed	264	10	313	12	274	11	251	10	677	26	64	2	277	11	290	11	175	7	2,585
Middle South Umpqua WAU	487	6	804	10	350	5	860	11	1,784	23	290	4	1,202	16	694	9	1,209	16	7,680

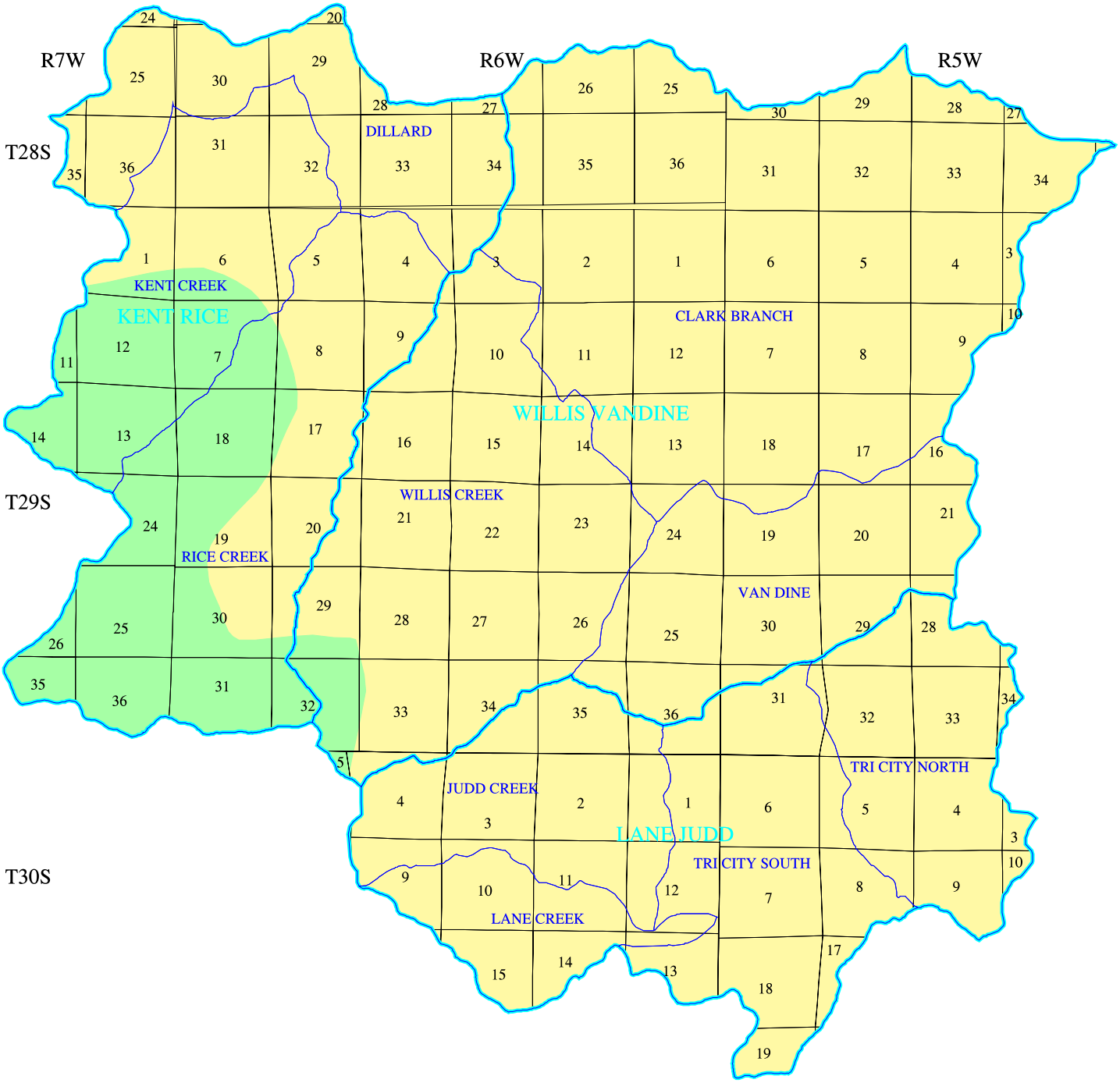
Table 6. 1993 Age Class Distribution in the Middle South Umpqua WAU. (Using Satellite Imagery Data).

	Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (31 to 80 Years Old)		Late Seral (80 + Years Old)		
Area	Acres	%	Acres	%	Acres	%	Acres	%	Total Acres
Dillard	2,312	57	1,313	32	224	6	220	5	4,069
Kent Creek	968	20	1,537	31	1,249	25	1,167	24	4,921
Rice Creek	1,306	16	2,372	30	2,371	30	1,881	24	7,930
Kent Rice Subwatershed	4,586	27	5,222	31	3,844	23	3,268	19	16,920
Judd Creek	472	13	2,189	60	444	12	558	15	3,663
Lane Creek	381	20	1,084	56	228	12	247	13	1,940
Tri City North	1,895	50	1,014	27	324	9	561	15	3,794
Tri City South	2,840	59	1,580	33	136	3	241	5	4,797
Lane Judd Subwatershed	5,588	39	5,867	41	1,132	8	1,607	11	14,194
Clark Branch	7,528	50	5,888	39	516	3	987	7	14,919
Van Dine	1,572	33	2,367	50	311	7	491	10	4,741
Willis Creek	1,460	17	4,360	51	1,294	15	1,508	17	8,622
Willis Vandine Subwatershed	10,560	37	12,615	45	2,121	7	2,986	11	28,282
Middle South Umpqua WAU	20,734	35	23,704	40	7,097	12	7,861	13	59,396

a. Grand Fir Zone

The Grand Fir Zone forms a transition between moist hemlock forests and the drier central valleys. This zone makes up about 13 percent of the Middle South Umpqua WAU. This area of mountains and foothills receives from 40 to 55 inches average annual precipitation. Elevation remains below about 3,200 feet.

Map 8. Middle South Umpqua Watershed Analysis Unit Vegetation Zones



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Drainages
Subwatershed
Section Lines
Vegetation Zones
Interior Valleys and Foothills
Grand Fir

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Douglas-fir dominates the older stands with grand fir common on the northern slopes and minor or absent on the south slopes. Golden chinkapin occurs regularly on north aspects. Pacific madrone and occasionally California black oak are common on south aspects. Incense cedar and big leaf maple are often present. Western redcedar and red alder are more common in very moist areas. The area is generally too dry for western hemlock except in some drainages or very moist north slopes.

Understory shrubs on north slopes include salal, cascade Oregon grape, western hazel, creambush oceanspray, red huckleberry, western prince's pine, whipplevine, yerba buena, and hairy honeysuckle. South slopes support any of the above, although red huckleberry, cascade Oregon grape, and salal, which require more moisture, have minor species occurrence. Grasses and poison oak become more abundant. Where the drier edge of the zone approaches the Interior Valleys and Foothills Zone, salal, red huckleberry, and even grand fir may drop out. Some key indicator species for the zone remain present such as Oregon grape, golden chinkapin, wild ginger, and inside-out-flower.

Serpentine soils present in this area are unique and the vegetation is not necessarily consistent with the Grand Fir Zone criteria. The overstory vegetation on serpentine soils consists mainly of Jeffrey pine and Incense-cedar. Some Douglas-fir, ponderosa pine, and Port-Orford cedar will grow on serpentine soils. Dwarf ceanothus, coffeeberry, rock fern, huckleberry oak, and grasses grow in the understory. The stocking capacity of serpentine soils is severely limited resulting in very low productivity.

The Grand Fir Zone in the Middle South Umpqua WAU represents a transition area and resembles vegetation in Josephine and Jackson Counties. Geological differences and climatic changes result in more species diversity and the increasing importance of California black oak, sugar pine, ponderosa pine, canyon live oak, incense cedar, and grasses, in the southern portion.

b. Interior Valleys and Foothills Zone

The Interior Valleys and Foothills Zone occupies approximately 87 percent of the Middle South Umpqua Watershed. Much of the zone is composed of hills and low mountains extending into the interior from both the Cascade Mountains and Coast Mountain Range. The average annual precipitation ranges from about 35 to 50 inches.

This zone is separated ecologically from the adjacent vegetative zones by its dry, warm climate, the high proportion of hardwoods in the uplands and the absence of indicator species from the Grand Fir Zone. Much of the natural vegetation of this zone has been affected by settlement or grazing. Large areas have been converted to cropland or improved pastures.

Uplands with the most favorable soils have coniferous forests of Douglas-fir and subordinate species such as Pacific madrone, bigleaf maple, California black oak, ponderosa pine, incense cedar, and sometimes Oregon white oak. The more droughty soils support hardwood dominated stands of Pacific madrone, Oregon white oak, and some California black oak. The droughty soils may contain minor amounts of

Douglas-fir, ponderosa pine, and incense cedar. Some shallow slopes support only scattered Oregon white oak and grass or shrubs such as wedgeleaf ceanothus and Pacific poison oak.

Bottomland vegetation changes with soil texture, drainage class, terrace level, and geographic location. Overstories range from black cottonwood dominated stands on deep sandy gravelly floodplains to Oregon white oak/Oregon ash dominated stands on poorly drained, clayey floodplains and terraces. California laurel is sometimes associated with streams. Ash-sedge swales are prominent in small, very wet areas. Some deep, well-drained soils on valley terraces support Douglas-fir along with bigleaf maple and incense cedar.

Understories on bottomlands vary with soil conditions but usually contain common snowberry and Pacific poison oak. A variety of other species, such as vine maple, mockorange, viburnum, Pacific ninebark, blue elderberry, creambush oceanspray, and western hazel may be present depending on site conditions. Some areas were naturally treeless meadows where species such as sedge, rush, and tufted hairgrass probably dominated very wet soil conditions.

Serpentine soils present in this area are unique and the vegetation is not necessarily consistent with the characteristics of the Interior Valleys and Foothills Zone. The overstory vegetation on serpentine consists mainly of Jeffrey pine and Incense-cedar. Some Douglas-fir, ponderosa pine, and Port-Orford-cedar may be present. Dwarf ceanothus, coffeeberry, rock fern, huckleberry oak, and grasses grow in the understory. The stocking capacity of serpentine soils is severely limited resulting in very low productivity.

2. Insects and Diseases

Insects and pathogens are capable of causing both large and small-scale disturbances across the landscape. However, the risk of large scale habitat loss due to insects and pathogens over the WAU is minor. Native insect and diseases may cause mortality of a single tree or small patch of trees (less than one acre). The magnitude of insect and disease related disturbance is greatly influenced by species composition, age class, stand structure, and history of other disturbances on the same site. Port-Orford cedar and white pine blister rust are introduced diseases that are concerns in the WAU. All other diseases in the WAU are native to the region and have evolved with their hosts.

a. Insects

Insect activity within stands in the WAU is present at endemic levels. Insect attacks and out breaks are almost always associated with conditions that stress the tree. There is a common association between root diseases and bark beetles. A high proportion of laminated root rot infected trees are actually killed by bark beetles and not by the fungus. Laminated root rot plays a significant role in maintaining endemic bark beetle populations over time. Bark beetle populations are most likely to increase and attack live trees the year after a minimum of three Douglas-fir trees per acre, which are at least ten inches in diameter at breast height (DBH) are killed (Goheen 1996).

Mountain pine beetle and western pine beetle also attack trees that are stressed by drought or root disease. However, infestations are more strongly correlated with low host vigor resulting from overstocking. The major hosts of the mountain pine beetle are ponderosa and sugar pines. Western pine beetle infests ponderosa pine.

When epidemic insect populations are reached, healthy trees may be attacked and killed. Direct control measures are impractical and generally not recommended. Damage can be reduced indirectly by thinning. Keeping trees in a healthy, vigorous condition is the most practical means of reducing the impact from bark beetles (Filip and Schmitt 1990).

b. Diseases

(1) Root Diseases

(a) Port-Orford Cedar

The Middle South Umpqua WAU is approximately two miles from the closest known natural occurring Port-Orford cedar (POC). Port-Orford cedar occurs in planted mixed conifer stands within the Middle South Umpqua WAU. Port-Orford cedar root disease (Phytophthora lateralis) is an introduced disease, which infects Port-Orford cedar. The disease may be present in the WAU but roadside surveys and aerial photography interpretation did not detect signs of the disease.

Port-Orford cedar root disease was first reported killing nursery stock around Seattle, Washington in 1923. The disease appeared in the native range of Port-Orford cedar in 1952. The disease has spread throughout much of the range of Port-Orford cedar in Oregon and northern California.

Old-growth trees die within two to four years after infection. Seedlings die within a few weeks (Roth et al. 1987). As the disease spreads, discoloration occurs simultaneously throughout the crown. Infected trees are often attacked by bark beetles, which speeds the death of the tree and may modify foliage discoloration by altering the mortality rate. In virtually all cases, infection of POC occurs in areas where obvious avenues for water borne spore dispersal exists. Infection is highly dependent on the presence of water in the immediate vicinity of susceptible tree roots. High risk areas for infection are stream courses, drainages, or low lying areas down slope from infection centers, or below roads and trails where new inoculum may be introduced. Major spread of the disease is through movement of infected soil in road construction, road maintenance, daily vehicle use, and logging operations. The fungus may also be carried on the feet of animals, particularly elk.

Port-Orford cedar regenerates profusely from surviving trees. The continuing supply of susceptible seedlings on high risk sites is likely to sustain a chronic disease source, threatening trees on more favorable sites.

Port-Orford-cedar occurs in planted mixed conifer stands within the Middle South Umpqua WAU. Extensive roadside and aerial surveys in the resource area during the summer of 1996 did not identify any natural POC (see Map 9). Proposed project areas would need to be surveyed for the presence of POC or the disease. Recommendations would be made on a site specific basis.

Sanitation, by removing POC adjacent to roads, has the potential to reduce the amount of inoculum present in a particular area. Preliminary tests indicate inoculum levels remain high the first three years following sanitation. Inoculum levels decrease after three years. Sites could become reinfected if POC returns to the site.

The type of road surfacing also is a factor for success of sanitation. Paved roads have the most success, followed by gravel roads, then natural surfaced roads. Rocking natural surfaced roads could limit the spread of inoculum by reducing the amount of soil adhering to vehicles.

(b) Other Root Diseases

Root diseases, besides Phytophthora lateralis, are present at endemic levels in the WAU and are not considered to be a concern. Laminated root rot (Phellinus weirii), annosus root disease (Heterobasidion annosum), armillaria root disease (Armillaria ostoyae), and black stain root disease (Leptographium wageneri) are common root diseases that may be present in the WAU. Root diseases can cause scattered mortality of individual trees or openings devoid of susceptible mature trees.

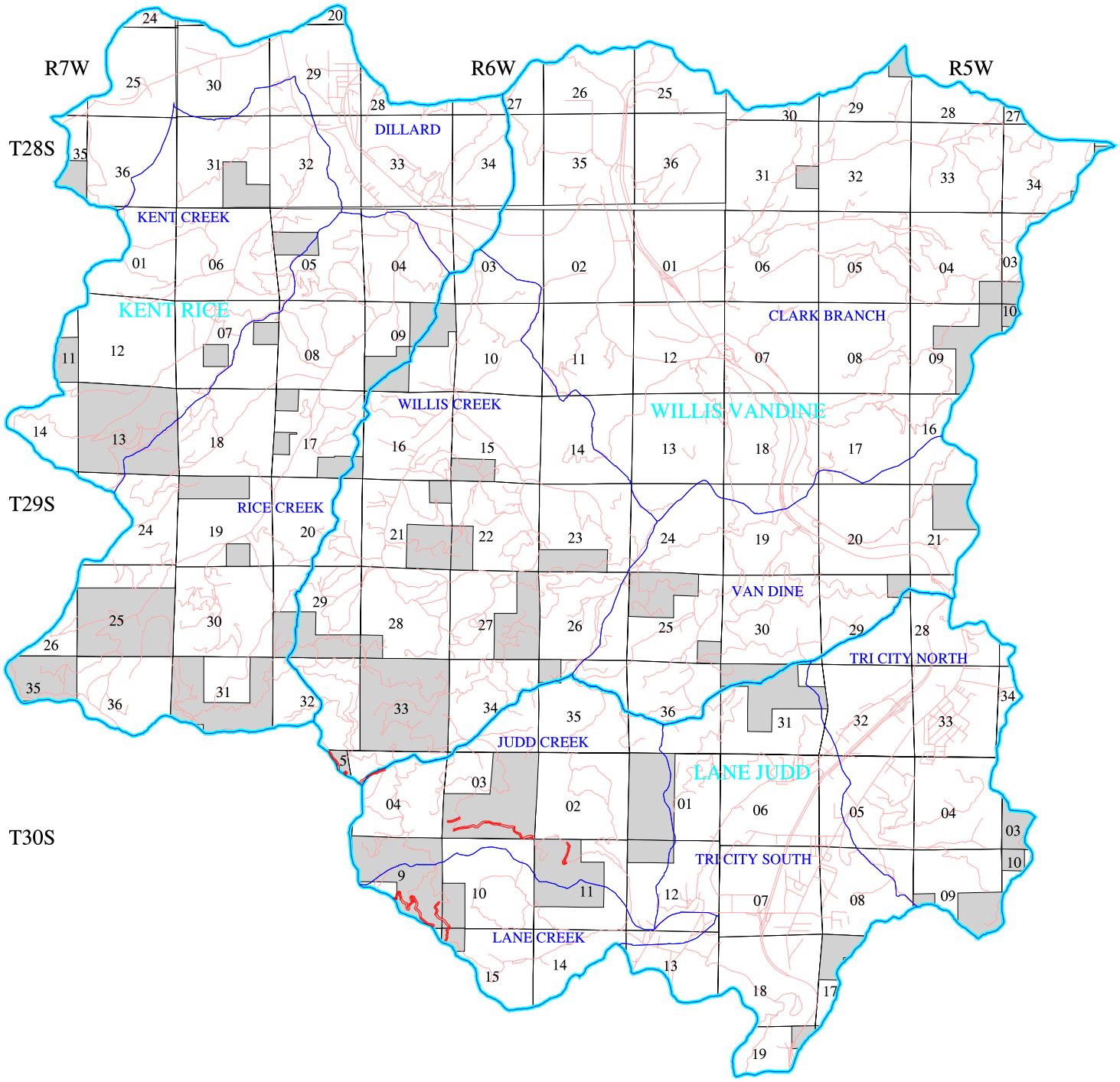
Root pathogens are extremely difficult to eradicate from the site once they become established. Depending on the disease, the damage can be minimized by increasing host vigor, favoring disease-tolerant conifer species, or reducing inoculum (Filip and Schmitt 1990).

(2) White Pine Blister Rust

White pine blister rust, caused by the fungus Cronartium ribicola, is a minor disease in the WAU. It infects five-needled pines, such as western white pine and sugar pine trees. Western white pine does not grow in the WAU. Sugar pine is a minor tree species in the WAU. The pathogen girdles and kills infected tree stems and branches. It causes top and branch death in larger trees (greater than 14 inches) and outright mortality in seedling, sapling, and pole-sized hosts. Infected larger trees may be attacked by bark beetles. Ribes (gooseberry and currant plants) are alternate hosts for the fungus and under the right environmental conditions release spores that infect five-needled pines. Moist cool weather in summer and fall favor the disease, whereas warm dry weather is unfavorable. Infection of pine requires at least two days of saturated atmosphere and maximum temperatures not exceeding 68 degrees Fahrenheit (Scharpf 1993). Pruning lower limbs of small sugar pines can affect the micro-habitat and reduce the chance of infection.

Tree improvement programs have developed resistant sugar pine trees that can tolerate infection by the fungus. Rust resistant stock would be used to reforest stands with sugar pine trees. Sugar pine is a desirable tree species because it is highly resistant to laminated root rot and is a preferred species for planting in root disease centers.

Map 9. Port-Orford Cedar in the Middle South Umpqua Watershed Analysis Unit



0 1 2 3 4 5 Miles

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Uninfected Port-Orford Cedar (Roadside Surveys)
Drainages
Subwatershed
Roads
BLM Administered Land
Section Lines

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3. Riparian Vegetation

Riparian Reserves within the Middle South Umpqua WAU account for approximately 35 percent (2,698 acres out of 7,682 acres) of BLM-administered land (see Table 7 and Map 10). The purpose of Riparian Reserves is to maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide greater connectivity of the watershed (USDA and USDI 1994b). Silvicultural treatments applied within Riparian Reserves would be to control stocking or reestablish, establish, or maintain desired vegetation characteristics to attain Aquatic Conservation Strategy objectives.

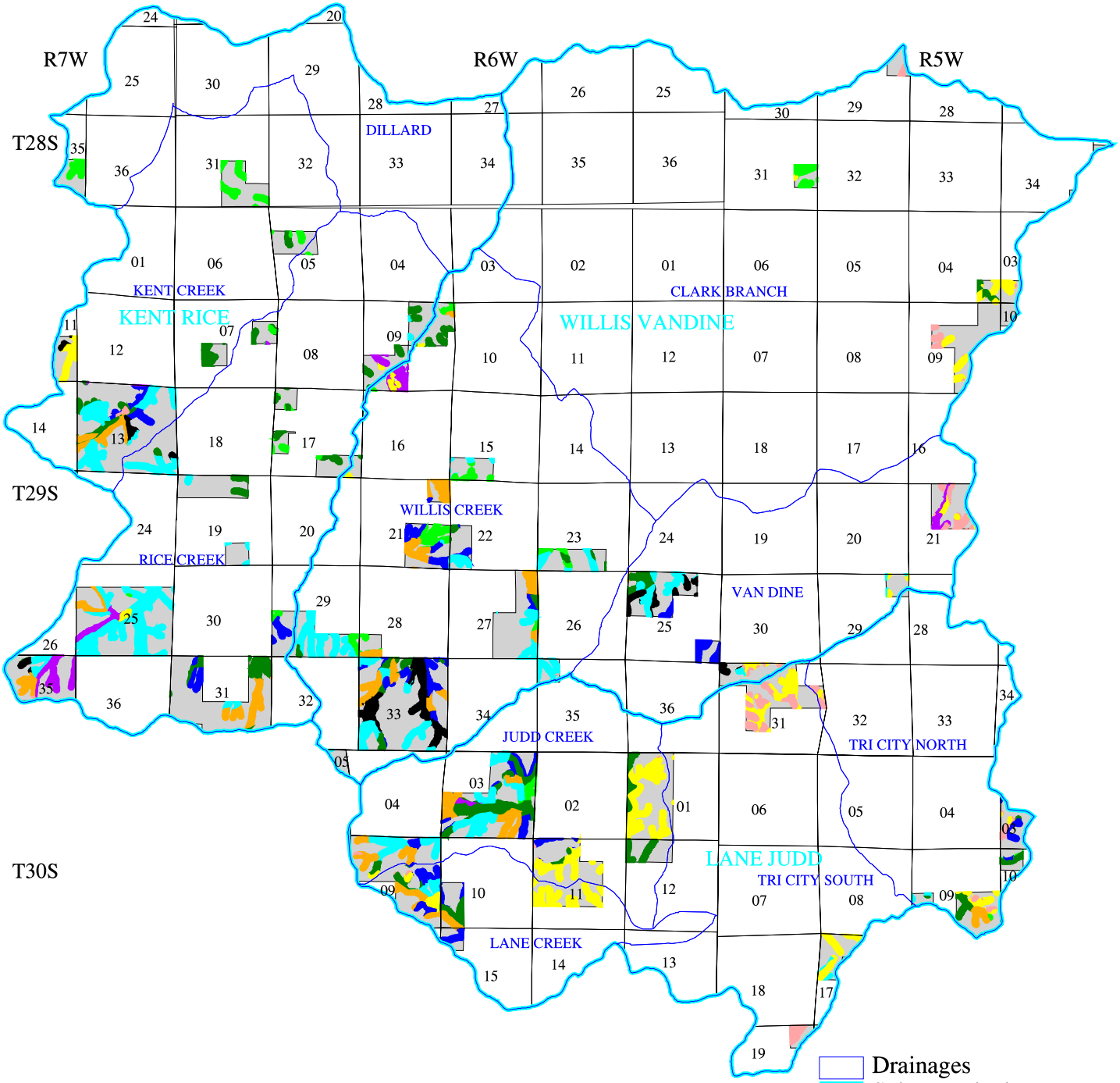
Riparian Reserve widths were developed using the Regional Ecosystem Office (REO) approved methodology in determining site tree heights for Riparian Reserves. This methodology uses the average site index computed from inventory plots throughout the fifth field watershed (Middle South Umpqua Watershed), which corresponds with this WAU. For this watershed analysis, Riparian Reserve widths use a site potential tree height of 160 feet. All intermittent streams, which are considered to be non-fish bearing streams for this watershed analysis, were analyzed using a Riparian Reserve width of 160 feet on each side of the stream. Perennial streams, which are considered to be fish bearing streams for this watershed analysis, were analyzed using a Riparian Reserve width of 320 feet (two times the site potential tree height) on each side of the stream. Actual projects would use site specific information, such as if a stream was fish bearing, to determine if a stream needed a Riparian Reserve width of 160 or 320 feet.

Riparian Reserve widths may be adjusted following watershed analysis, a site specific analysis, and describing the rationale for the adjustment through the appropriate NEPA decision making process (USDI 1995). Critical hillslope, riparian, channel processes and features, and the contribution of Riparian Reserves to benefit aquatic and terrestrial species would be the basis for the analysis. At a minimum, a fisheries biologist, soil scientist, hydrologist, botanist, and wildlife biologist would be expected to conduct the analysis for adjusting Riparian Reserve widths. The Riparian Reserve Module could be used to adjust Riparian Reserve widths.

Table 7. 1999 Riparian Reserve Age Class Distribution.

	Number of Acres by Age Class and Percent of Total																		
AREA	Nonforest	%	0 to 10	%	10 to 20	%	20 to 30	%	30 to 50	%	50 to 80	%	80 to 120	%	120 to 200	%	200 +	%	TOTAL
Dillard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	100	0	0	18
Kent Creek	4	1	28	10	12	4	31	11	96	33	2	1	26	9	34	12	56	19	289
Rice Creek	0	0	31	6	9	2	77	14	235	43	72	13	6	1	16	3	97	18	543
Kent Rice Subwatershed	4	0	59	7	21	2	108	13	331	39	74	9	32	4	68	8	153	18	850
Judd Creek	3	1	44	8	0	0	101	17	124	21	6	1	144	25	15	3	145	25	582
Lane Creek	2	1	43	22	0	0	31	16	15	8	0	0	74	38	0	0	30	15	195
Tri City North	20	20	12	12	0	0	16	16	3	3	0	0	23	23	2	2	24	24	100
Tri City South	54	40	0	0	0	0	0	0	4	3	0	0	76	57	0	0	0	0	134
Lane Judd Subwatershed	79	8	99	10	0	0	148	15	146	14	6	1	317	31	17	2	199	20	1,011
Clark Branch	16	18	0	0	0	0	0	0	0	0	0	0	41	47	22	25	9	10	88
Van Dine	25	13	28	15	33	18	1	1	43	23	16	9	15	8	0	0	26	14	187
Willis Creek	0	0	77	11	100	15	131	19	216	32	22	3	8	1	79	12	50	7	683
Willis Vandine Subwatershed	41	4	105	11	133	14	132	14	259	27	38	4	64	7	101	11	85	9	958
Middle South Umpqua WAU	124	4	263	9	154	5	388	14	736	26	118	4	413	15	186	7	437	16	2,819

Map 10. Riparian Reserve Age Class Distribution within the Middle South Umpqua Watershed Analysis Unit



Drainages
Subwatershed
Section Lines

Age Classes
- Nonforest
- At Least 200 Years Old
- 120 to 200 Years Old
- 80 to 120 Years Old
- 50 to 80 Years Old
- 30 to 50 Years Old
- 20 to 30 Years Old
- 10 to 20 Years Old
- 0 to10 Years Old
- BLM Administered Lands

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4. Private Lands

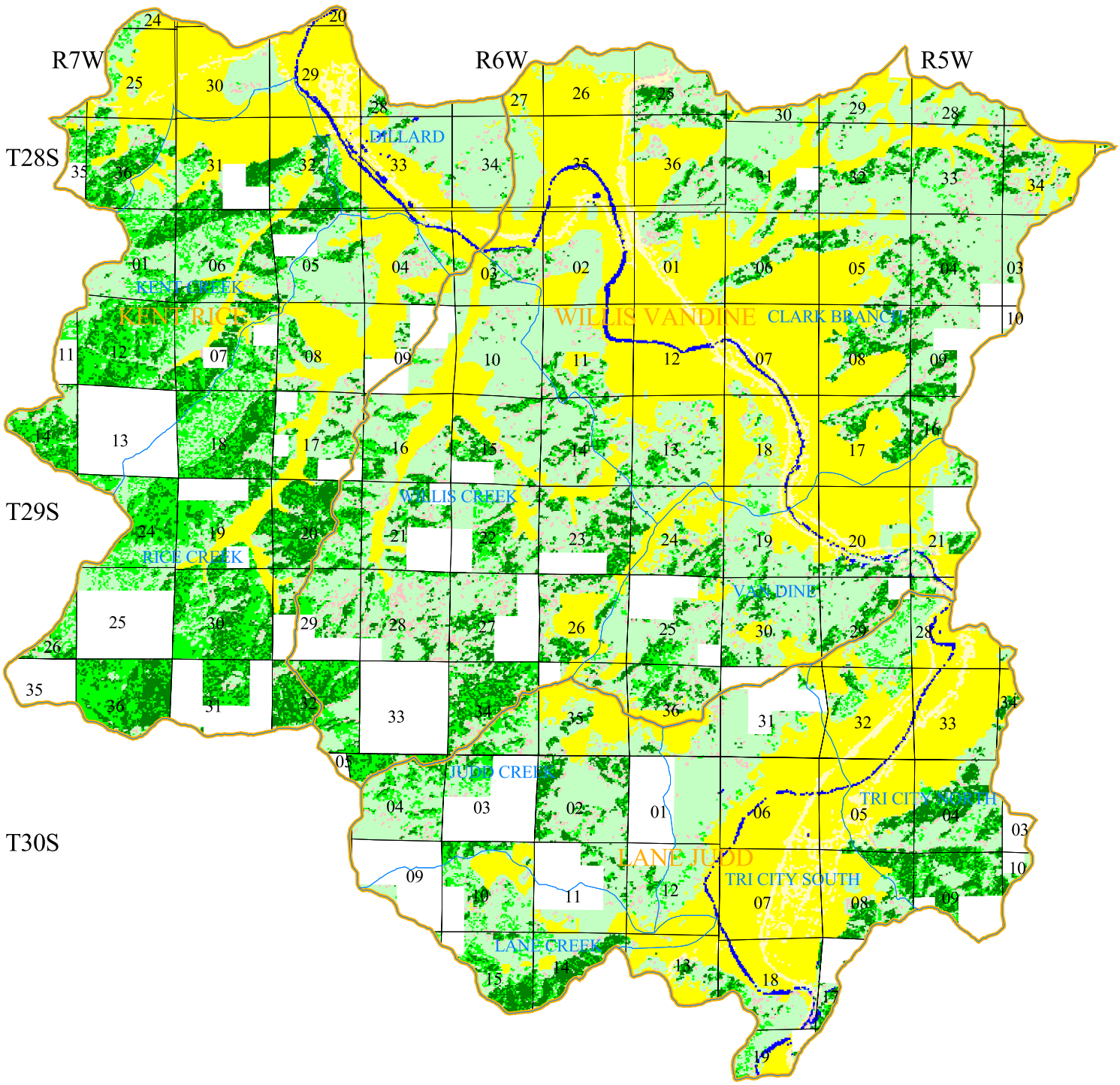
Private lands account for approximately 87 percent (51,713 acres) of the Middle South Umpqua WAU (see Table 8 and Map 11). Private ownership in the valleys, especially along the South Umpqua River and the northern portion of the WAU consists mainly of agricultural and urban (residential) lands (17,758 acres). The rest of the private lands are mainly forested lands intermingled with BLM-administered lands. Satellite imagery from 1993 was the most current data available to characterize private lands. Approximately 40 percent of the private lands have been harvested in the past 30 years.

Although private lands are a major component of this Watershed Analysis Unit (87 percent), the focus of this analysis is on BLM-administered lands. Private forest lands are in a constant state of change and would continue to be harvested when growth and economic factors provide a satisfactory return to the landowner. The BLM cannot predict the timing or amount of harvesting which may occur on private lands in this WAU.

Table 8. 1993 Private Age Class Distribution in the Middle South Umpqua WAU. (Using Satellite Imagery Data).

	Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (31 to 80 Years Old)		Late Seral (80 + Years Old)		
Area	Acres	%	Acres	%	Acres	%	Acres	%	Total Acres
Dillard	2,311	58	1,305	33	213	5	179	4	4,008
Kent Creek	941	23	1,333	33	1,010	25	789	19	4,073
Rice Creek	1,260	21	1,934	32	1,704	28	1,207	20	6,105
Kent Rice Subwatershed	4,512	32	4,572	32	2,927	21	2,175	15	14,186
Judd Creek	437	18	1,456	60	255	11	278	11	2,426
Lane Creek	362	24	729	49	182	12	217	15	1,490
Tri City North	1,887	54	891	25	291	8	430	12	3,499
Tri City South	2,809	64	1,379	31	108	2	120	3	4,416
Lane Judd Subwatershed	5,495	46	4,455	38	836	7	1,045	9	11,831
Clark Branch	7,485	51	5,737	39	485	3	842	6	14,549
Van Dine	1,548	36	2,082	49	254	6	367	9	4,251
Willis Creek	1,399	20	3,689	53	833	12	975	14	6,896
Willis Vandine Subwatershed	10,432	41	11,508	45	1,572	6	2,184	8	25,696
Middle South Umpqua WAU	20,439	40	20,535	40	5,335	10	5,404	10	51,713

Map 11. Middle South Umpqua Watershed Analysis Unit
1993 Private Age Class Distribution (Using Satellite Imagery)



C. Interpretation

The main causes for the difference between the conditions in 1936 and 1993 are land ownership, fire suppression, timber harvesting, and to a lesser degree, natural disturbances. Timber harvests provided the early seral vegetative structure and pattern that currently exists. Historically, the early seral stage component was achieved through natural disturbance, primarily stand replacing fires that occurred on small portions of the landscape.

Although private lands are a major component of this Watershed Analysis Unit (87 percent), the focus of the interpretation is on BLM-administered land. The timing or amount of harvest on private lands cannot be predicted.

Bureau of Land Management administered lands available for intensive forest management are those lands outside of Riparian Reserves and other areas reserved or withdrawn from timber harvesting. The WAU contains approximately 3,828 acres (50 percent) of BLM-administered lands that are available for intensive forest management (see Table 9). Silvicultural practices including prescribed fire could be used to obtain desired vegetation conditions in special habitat areas.

Management direction from the Northwest Forest Plan and the Roseburg District RMP states that 15 percent of all Federal lands, considering all Land Use Allocations, within fifth field watersheds should remain in late-successional forest stands. The Middle South Umpqua Watershed is a fifth field watershed. Approximately 40 percent (3,105 acres out of 7,682 acres) of the BLM-administered land within the Middle South Umpqua Watershed (the fifth field watershed) is in forest stands at least 80 years old (late-successional) (see Table 5). The Middle South Umpqua Watershed meets the Standard and Guideline to retain 15 percent of all Federal lands within fifth field watersheds in late-successional forest stands. In addition, the Middle South Umpqua Watershed would meet the Standard and Guideline to retain 15 percent of all Federal lands within fifth field watersheds in late-successional forest stands if only reserved or withdrawn lands are considered. Approximately 1,719 acres (22 percent) of the Middle South Umpqua Watershed is reserved and at least 80 years old (see Table 10).

Matrix lands in the Middle South Umpqua WAU are to be managed for timber production to help meet the Probable Sale Quantity (PSQ) established in the Roseburg District RMP. If all of the Matrix lands greater than 80 years old were to be harvested about 17 percent (1,384 acres) of the BLM-administered lands would be affected. Map 12 and Table 11 show what the age class distribution would be based on a timber harvesting plan through the year 2024. Table 12 compares the 1999 and 2024 age class distributions based on the same timber harvesting plan.

Table 9. Acres of BLM Administered Land by Land Use Allocation.

	Reserved or Withdrawn		Connectivity		GFMA		
Area	Acres	%	Acres	%	Acres	%	Total Acres
Dillard	13	21	48	79	0	0	61
Kent Creek	358	42	1	0	489	58	848
Rice Creek	647	35	313	17	865	47	1,825
Kent Rice Subwatershed	1,018	37	362	13	1,354	50	2,734
Judd Creek	924	75	0	0	313	25	1,237
Lane Creek	287	64	0	0	164	36	451
Tri City North	132	45	73	25	90	31	295
Tri City South	305	80	2	1	74	19	381
Lane Judd Subwatershed	1,648	70	75	3	641	27	2,364
Clark Branch	227	61	125	34	19	5	371
Van Dine	298	61	53	11	139	28	490
Willis Creek	666	39	137	8	923	53	1,726
Willis Vandine Subwatershed	1,191	46	315	12	1,081	42	2,587
Middle South Umpqua WAU	3,857	50	752	10	3,076	40	7,685

Table 10. Age Class Distribution in Withdrawn Areas Within the Middle South Umpqua WAU.

	Number of Acres by Age Class and Percent of Total																		
AREA	Nonforest	%	0 to 10	%	10 to 20	%	20 to 30	%	30 to 50	%	50 to 80	%	80 to 120	%	120 to 200	%	200 +	%	TOTAL
Dillard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	100	0	0	13
Kent Creek	4	1	41	11	16	4	29	8	120	34	3	1	27	8	43	12	75	21	358
Rice Creek	14	2	29	4	17	3	55	9	256	40	70	11	9	1	17	3	180	28	647
Kent Rice Subwatershed	18	2	70	7	33	3	84	8	376	37	73	7	36	4	73	7	255	25	1,018
Judd Creek	21	2	41	4	0	0	91	10	132	14	6	1	382	41	24	3	226	24	923
Lane Creek	6	2	33	11	0	0	31	11	12	4	0	0	156	54	0	0	49	17	287
Tri City North	36	27	10	8	0	0	21	16	4	3	0	0	28	21	2	2	31	23	132
Tri City South	132	43	0	0	0	0	0	0	13	4	0	0	155	51	0	0	5	2	305
Lane Judd Subwatershed	195	12	84	5	0	0	143	9	161	10	6	0	721	44	26	2	311	19	1,647
Clark Branch	121	53	0	0	0	0	0	0	0	0	0	0	88	39	17	7	2	1	228
Van Dine	114	38	33	11	32	11	0	0	48	16	27	9	21	7	0	0	23	8	298
Willis Creek	12	2	79	12	101	15	154	23	149	22	24	4	8	1	92	14	46	7	665
Willis Vandine Subwatershed	247	21	112	9	133	11	154	13	197	17	51	4	117	10	109	9	71	6	1,191
Middle South Umpqua WAU	460	12	266	7	166	4	381	10	734	19	130	3	874	23	208	5	637	17	3,856

Map 12. Middle South Umpqua Watershed Analysis Unit
Potential Year 2024 Age Class Distribution

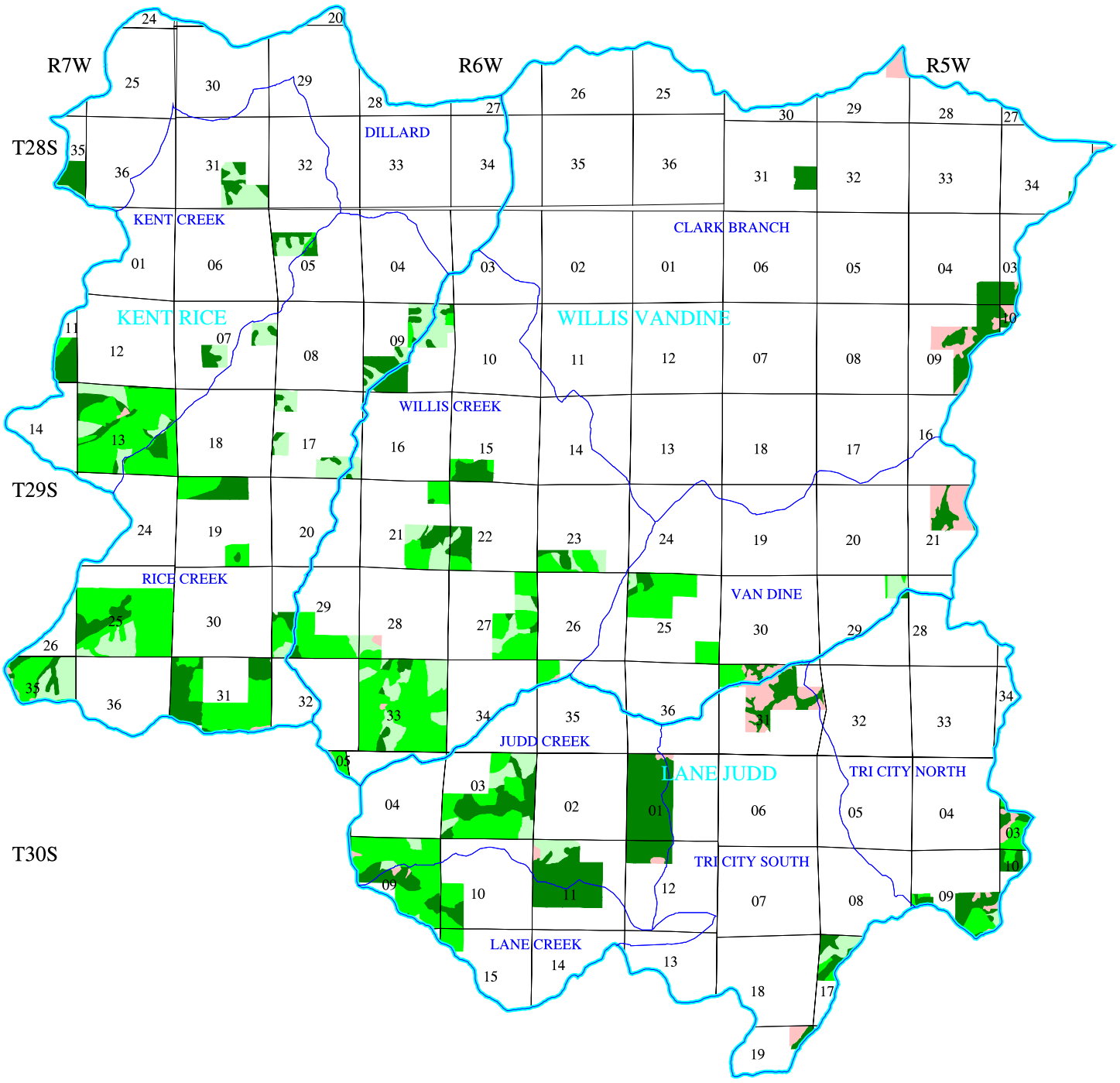


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Table 11. 2024 BLM Age Class Distribution.

	Number of Acres by Age Class and Percent of Total								
AREA	Nonforest	%	0 to 30	%	30 to 80	%	At Least 80 Years Old	%	TOTAL
Dillard	0	0	6	10	0	0	55	0	61
Kent Creek	5	1	232	27	388	46	220	26	848
Rice Creek	17	1	379	21	934	51	487	27	1,825
Kent Rice Subwatershed	22	1	617	23	1,322	48	762	28	2,734
Judd Creek	21	2	168	14	403	33	643	52	1,237
Lane Creek	6	1	5	1	226	50	212	47	450
Tri City North	43	15	10	3	103	35	138	47	295
Tri City South	130	34	41	11	14	4	194	51	381
Lane Judd Subwatershed	200	8	224	9	746	32	1,187	50	2,363
Clark Branch	126	34	0	0	0	0	243	66	370
Van Dine	123	25	39	8	247	50	81	17	490
Willis Creek	14	1	415	24	1,008	58	283	16	1,725
Willis Vandine Subwatershed	263	10	454	18	1,255	49	607	23	2,585
Middle South Umpqua WAU	485	6	1,295	17	3,323	43	2,556	33	7,682

Table 12. Comparison of Age Class Distributions in the Middle South Umpqua WAU between 1999 and 2024 (based on a timber harvesting plan through 2024).

Age Classes	1999		2024	
	Acres	Percent	Acres	Percent
0 to 30 Years Old	2,014	26	1,295	17
30 to 80 Years Old	2,074	27	3,323	43
At Least 80 Years Old	3,105	40	2,556	33
Nonforest	487	6	487	6

1. Silviculture Actions

Silviculture actions would be based on Land Use Allocations. Intensive forest management would occur on General Forest Management Areas. Silviculture actions within Riparian Reserves would tend to focus on stands regenerated following timber harvesting or stands that were thinned. Silvicultural practices applied within Riparian Reserves would be to control stocking, reestablish and manage stands, establish and maintain desired non-conifer vegetation, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.

a. Riparian Reserves

Commercial thinning or density management within overstocked Riparian Reserves would promote tree survival and growth. These activities would maintain or restore tree growth and vigor, reduce the probability of an insect infestation, maintain or enhance the existing diversity, and attain larger trees in a shorter time period. Excluding Riparian Reserves from commercial thinning/density management would limit tree growth, maintaining smaller diameter trees from which snags and down logs would be created from. Activities within Riparian Reserves would be to acquire desired vegetative characteristics and to achieve Aquatic Conservation Strategy objectives.

Table 13 shows that in about 55 years approximately 77 percent of the Riparian Reserves would be at least 80 years old. In approximately 80 years, all of the forested Riparian Reserves would be at least 80 years old. Approximately four percent of the Riparian Reserves are considered to be nonforested.

Table 13. Percent of Riparian Reserves at Least 80 Years Old in the Middle South Umpqua Watershed (Fifth Field).

Year	1999	2009	2019	2029	2039	2049	2054	2059	2069	2079
Percent	37	39	41	45	62	72	77	82	88	96

b. Matrix Land Use Allocation

Providing early-successional habitat is one objective of the Matrix Land Use Allocation. The early seral stage comprises approximately 2,079 acres (28 percent) of the Matrix lands. Approximately 1,790 acres are in GFMA and 289 acres are in Connectivity/Diversity Blocks.

(1) Site Preparation, Reforestation, and Maintenance

Regeneration of newly harvested units is usually achieved by planting seedlings following site preparation. Genetically selected stock would be planted, when available. A mixture of species appropriate to the site would be planted, monitored, and maintained. Vegetation treatments may be necessary to allow seedlings to become established. Mulching to reduce competition from grass may be necessary at lower elevations

where grass can affect seedling survival. Higher elevation sites may not need mulching but brush competition could affect seedling survival.

(2) Precommercial Thinning

Precommercial thinning maintains stand vigor and controls species composition and stand density. Stands between five and 15 years of age and with high tree densities are typically the type of stands precommercially thinned. Approximately 468 acres in the WAU could be precommercially thinned within the next ten years. Approximately 618 acres have been precommercially thinned since the 1960s.

(3) Fertilization

Thinned stands could be fertilized to increase diameter and height growth, improve tree vigor, and maintain live crown ratio. Fertilization may be used to maintain forest stand development or improve desired habitat development. Fertilization actions would be designed to apply 200 pounds of available nitrogen in the form of urea based prill by helicopter.

(4) Pruning

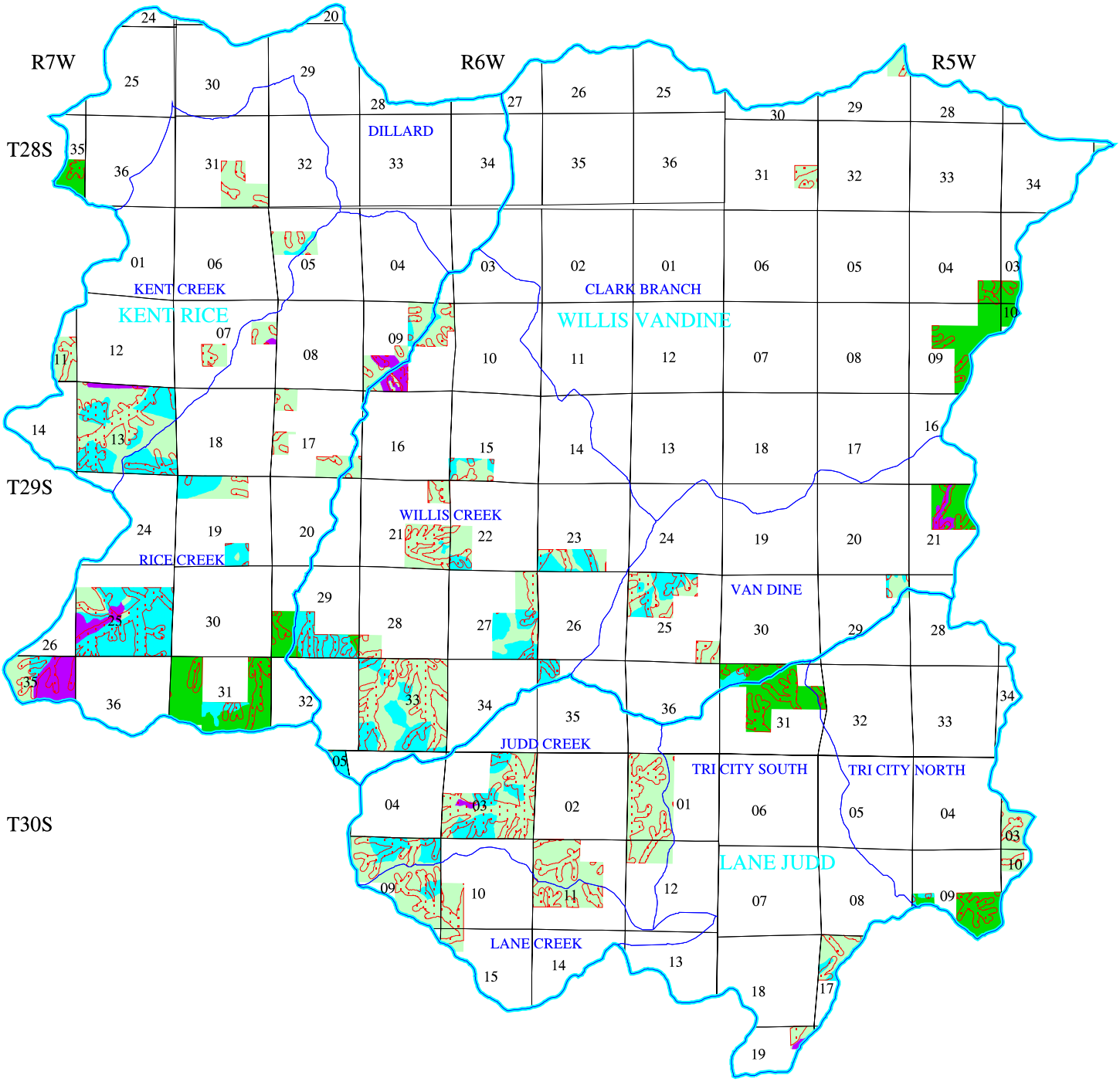
Pruning young stands increases wood quality through the production of clear wood in a shorter time than would be required without the action. Stands on higher quality sites could be pruned following precommercial thinning. Pruning young sugar pine trees to a height of ten feet may reduce the risk of mortality caused by white pine blister rust.

(5) Commercial Thinning/Density Management

The mid seral stage consists of approximately 2,054 acres (27 percent) of the Matrix lands. Approximately 1,834 acres occur in GFMA and 220 acres in Connectivity/Diversity Blocks. Most of the acres are in the 30 to 60 year age class, with only 160 acres in the 60 to 80 year age class. One objective of the Matrix is to provide a sustainable supply of timber and other forest commodities. Commercial thinning in GFMA or density management in Connectivity/Diversity Blocks would be carried out where practical and where increased gains in timber production are likely. Thinning intervals may range from 10 to 30 years. Thinning intervals may vary by site class, with poor sites having longer intervals. The locations of potential commercial thinning stands are shown on Map 13. Based on 1998 stand exam data, approximately 130 acres could be commercially thinned and density management could occur on 28 acres within the next ten years.

Stands considered suitable for commercial thinning generally have a closed canopy, dead lower limbs, dead standing and down trees, and slowed tree growth. These conditions indicate mortality is occurring in the suppressed and intermediate sized trees. Suppression mortality occurs in stands with a relative density index greater than 65 percent (using the Organon growth and yield model), which is considered the lower

Map 13. Middle South Umpqua Watershed Analysis Unit
Potential Commercial Thinning Stands



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Drainages
Subwatershed
Section Lines
Riparian Reserves
Age Classes
50 to 80 Years Old
30 to 50 Years Old
Land Use Allocations
CON
GFMA

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limit of competition mortality. Relative Density Index (RDI) is the ratio of actual stand density to the maximum stand density attainable in a stand with the same mean tree volume (Drew and Flewelling 1979). Thinning should maintain the stand with a relative density index between 40 and 65 percent (using Organon).

Commercial thinning prescriptions would vary based on the Land Use Allocation. On GFMA lands, commercial thinning would be designed to produce high volume productivity levels. Potential commercial thinning stands in the Middle South Umpqua WAU would be between 40 and 80 years old.

In Connectivity/Diversity Blocks, density management would provide habitat for a variety of organisms associated with both late-successional and younger forests. Commercial thinning would be designed to produce high volume productivity levels. Density management would accelerate development of the stand into a multilayered stand with large trees, canopy gaps for spatial diversity and understory development, snags, and large down wood. Unthinned patches could be retained to provide wildlife habitat. Treatments could take advantage of opportunities to optimize habitat for late-successional forest related species in the short term. Density management could occur in stands under 120 years of age. Older stands which currently exhibit late-successional or old-growth characteristics could be retained without active management, unless they are identified as needing treatment as part of a risk reduction effort.

(6) Regeneration Harvests

The late seral stage consists of approximately 2,937 acres (39 percent) of the Matrix lands. Most regeneration harvest would occur in the late seral stands. These stands would help provide a sustainable supply of timber and other forest commodities.

The GFMA Land Use Allocation contains approximately 2,225 acres in late seral stands. Regeneration harvests would be programmed for stands at least 60 years old. Long term rotation age would be planned for culmination of mean annual increment (CMAI), which generally occurs between 80 and 110 years old in this area. The modified reserve seed-tree method of harvest removes the majority of a stand in a single entry except for six to eight conifer trees per acre. Coarse woody debris and snags would be retained to meet management objectives.

Connectivity/Diversity Blocks contain approximately 712 acres in late seral stands. Connectivity/Diversity Blocks provide important ecological functions, such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components (i.e. down logs, snags, and large trees). Regeneration harvests would be programmed in late-successional stands. Connectivity/Diversity Blocks would be managed using a 150 year area control rotation. Between 12 and 18 green conifer trees per acre and 120 linear feet of viable down logs per acre would be left within regeneration harvest units. At least 25 percent of each Connectivity/Diversity Block would be maintained in late-successional forests.

There are five Connectivity/Diversity Blocks in the Middle South Umpqua WAU. All of the Connectivity/Diversity Blocks have more than 25 percent in late-successional forests (see Table 14). The Connectivity/Diversity Blocks meet the Standard and Guideline to maintain at least 25 percent of each Connectivity/Diversity Block in late-successional forests. Three of the five Connectivity/Diversity Blocks have at least 25 percent of the reserved areas in late-successional forests.

Table 14. Acres of Late Seral Stands in Connectivity/Diversity Blocks in the Middle South Umpqua WAU.

Connectivity/Diversity Blocks	Total Acres in Block	Amount of Reserved or Withdrawn Areas 80 Years Old or Older		Total Area 80 Years Old or Older	
		Acres	Percent	Acres	Percent
Block 3	234	46	20	234	100
Block 4	714	108	15	267	37
Block 8	735	193	26	560	76
Block 13	1,775	555	31	855	48
Block 72	588	183	31	380	65

2. Fire and Fuels Management

Treatments of natural fuels may be planned near areas with high recreation use, along heavily traveled road corridors, or in forest stands to reduce the risks of a wildfire, improve habitat of special status species, or improve forest health. Prescribed underburning, pile burning, and manual or mechanical treatments could be used in areas where wildfire exclusion has resulted in natural fuel accumulations considered to be unnatural and wildfire is considered to be a high risk to forest resources. Extensive fuels management treatments are difficult to justify for the sole reason of wildfire risk reduction. Other site specific resource objectives would normally be the basis for prescribing a fuels treatment on natural forest fuels. Prescribed broadcast burning poses risks that in many cases would outweigh potential risk reduction benefits. Prescribed broadcast burning, pile burning, manual or mechanical fuels treatments, or fuels removal would be applied primarily on activity fuels created from timber management operations.

Fire management in the Middle South Umpqua WAU would continue to require an aggressive suppression strategy on all unplanned wildland fires. The Roseburg District Fire Management Plan, prepared June 1998, identified appropriate fire management activities for Matrix, Riparian Reserve, and Late-Successional Reserve Land Use Allocations. The Fire Management Plan also identified three categories of fire management or protection that covers all Land Use Allocations. The fire prevention contract with The Oregon Department of Forestry requires all unplanned wildland fires to be suppressed. Additionally, the initial attack standards are to control 94 percent of all fires before they reach ten acres in size.

V. Geology, Soils, and Erosion Processes

A. Geology

The Middle South Umpqua WAU is comprised of volcanic and sedimentary rocks within the Klamath Mountains geologic province. Geology of the WAU is shown on Map 14. Unit descriptions are taken primarily from the Geologic Map of Oregon by George W. Walker and Norman S. MacLeod (1991).

Jop

Otter Point Formation of Dott (1971) and related rocks (Upper Jurassic) - Highly sheared graywacke, mudstone, siltstone, and shale with lenses and pods of sheared greenstone, limestone, chert, blueschist, and serpentine.

Ju

Ultramafic and related rocks of ophiolite sequences (Jurassic) - Predominantly harzburgite and dunite with both cumulate and tectonite fabrics. Locally altered to serpentinite. Includes gabbroic rocks and sheeted diabasic dike complexes.

Jv

Volcanic rocks (Jurassic) - Lava flows, flow breccia, and agglomerate dominantly of plagioclase, pyroxene, and hornblende porphyritic and aphyric andesite. Includes flow rocks that range in composition from basalt to rhyolite as well as some interlayered tuff and tuffaceous sedimentary rocks. Commonly metamorphosed to greenschist facies; locally foliated, schistose or gneissic.

KJds

Sedimentary rocks - Sandstone, conglomerate, graywacke, rhythmically banded chert lenses.

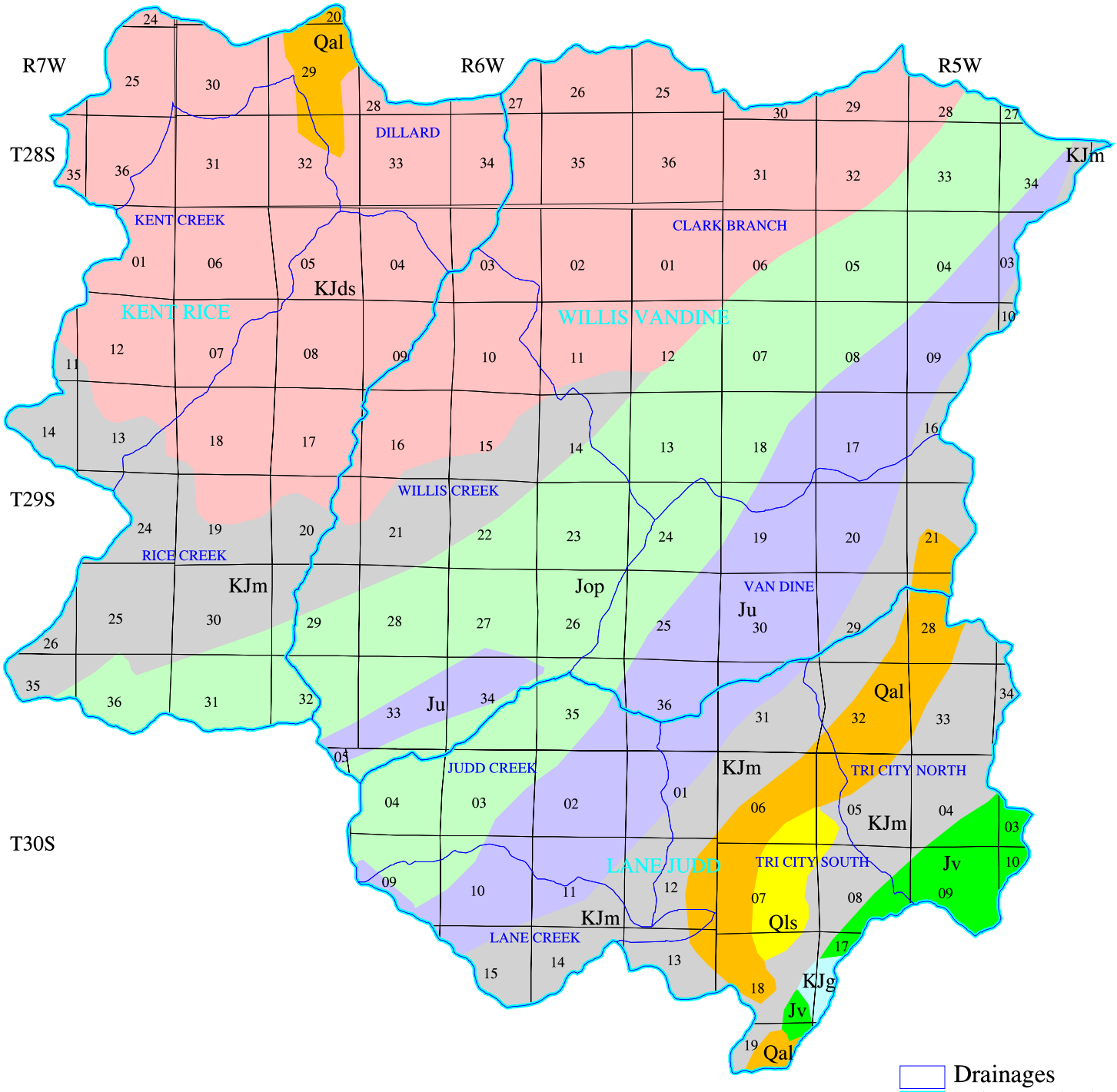
KJg

Granitic rocks (Creataceous and Jurassic) - Mostly tonality and quartz diorite but including lesser amounts of other granitoid rocks.

KJm

Myrtle Group (Lower Cretaceous and Upper Jurassic) - Conglomerate sandstone, siltstone, and limestone. Locally fossiliferous.

Map 14. Middle South Umpqua Watershed Analysis Unit Geology



Qal

Alluvial deposits (Holocene) - Sand, gravel, and silt forming floodplains and filling channels of present streams. In places includes talus and slope wash.

Qls

Landslide and debris-flow deposits (Holocene and Pleistocene) - Unstratified mixtures of fragments of adjacent bedrock. Locally includes slope wash and colluvium.

B. Soils

1. Historic and Current Conditions

The main sources of information for the soils section are the National Cooperative Soil Survey (NCSS) of Douglas County, conducted by the Natural Resources Conservation Service (NRCS) and the Timber Production Capability Classification (TPCC) conducted by the Bureau of Land Management. The Douglas County Soil Survey was mapped at an order 2 to order 3 level of detail. Tables and maps built from NCSS data include private as well as BLM-administered lands. Tables and maps built from TPCC data only include information from BLM-administered lands.

Soils in the Middle South Umpqua Watershed Analysis Unit (WAU) have developed dominantly from volcanic and sedimentary parent materials within the Klamath Mountains. The main soils related properties considered to be significant for planning and analysis, using the NCSS, are hydric soils, floodplain soils, somewhat poorly drained soils, conglomerate soils, serpentine soils, prime farmland soils and granitic soils (see Table 15 and Map 15).

a. National Cooperative Soil Survey (NCSS) of Douglas County Information

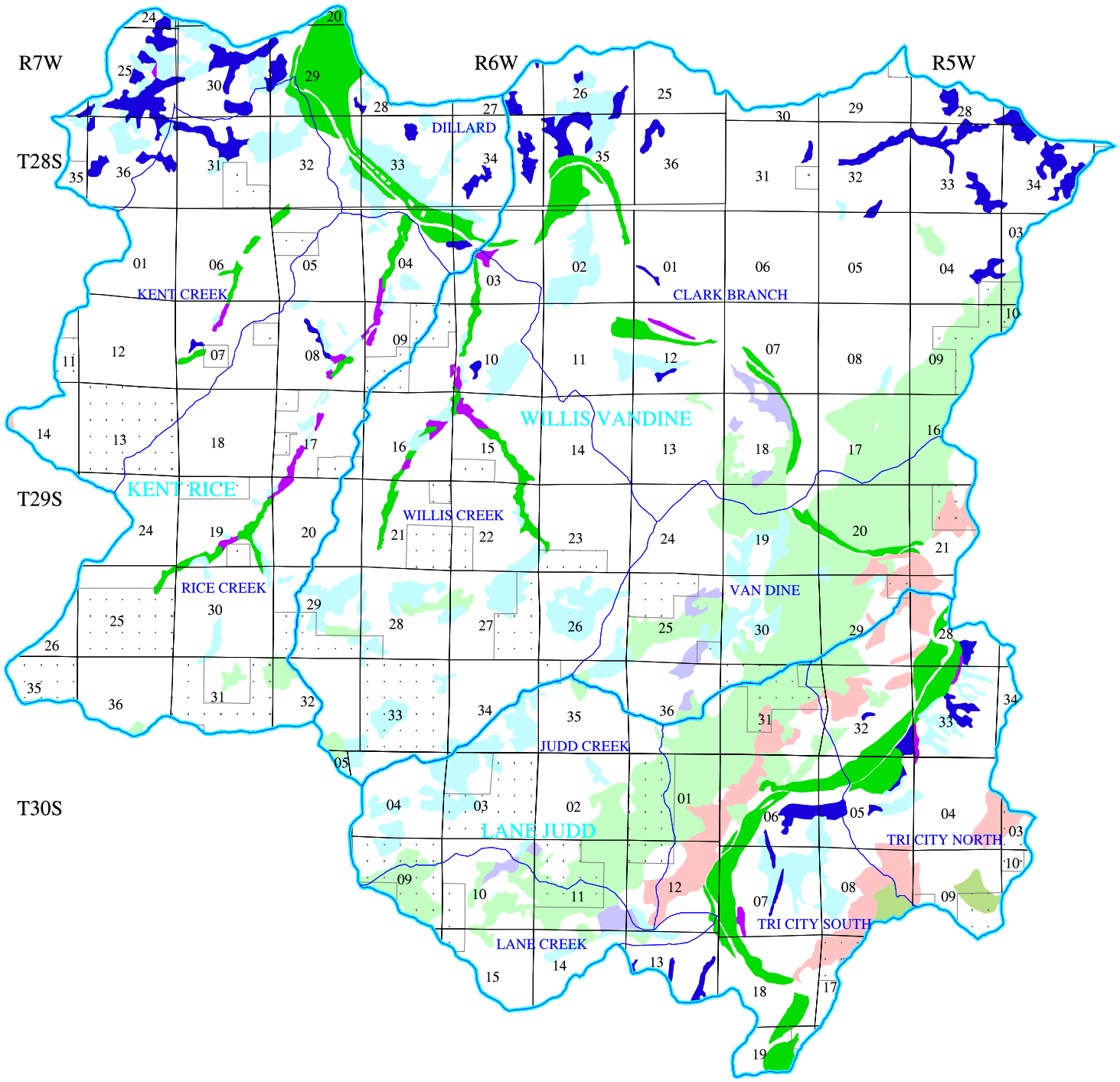
(1) Floodplain Soils

There are 2,216 acres of floodplain soils on private land and nine acres on BLM-administered land. The floodplain soils occur mostly in the Dillard, Tri City South, Tri City North, and Clark Branch Drainages. Floodplain management objectives on BLM-administered land include A) Reduce the risk of flood loss or damage to property. B) Minimize the impact of flood loss on human safety, health, and welfare. C) Restore, maintain, and preserve the natural and beneficial functions of floodplains.

Table 15. Soil Management Concerns Within the Middle South Umpqua WAU.

Drainage	Acres of Floodplain Soils		Acres of Somewhat Poorly Drained Soils		Acres of Somewhat Poorly Drained Floodplain Soils		Acres of Hydric Soils		Acres of Conglomerate Soils		Acres of Serpentine Soils		Acres of Somewhat Poorly Drained Serpentine Soils		Acres of Granitic Soils		Acres of Prime Farmland Soils	
	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private
Dillard	0	598	0	628	0	4	0	404	0	0	0	0	0	0	0	0	0	708
Kent Creek	1	85	1	156	0	9	0	94	0	7	0	0	0	0	0	0	1	125
Rice Creek	2	127	2	161	0	77	0	13	0	0	17	79	0	0	0	0	0	231
Kent Rice Subwatershed	3	810	3	945	0	90	0	511	0	7	17	79	0	0	0	0	1	1,064
Judd Creek	0	0	84	380	0	0	0	0	0	32	413	335	6	13	0	0	0	0
Lane Creek	0	3	0	58	0	0	0	0	0	0	281	290	0	81	0	0	0	36
Tri City North	0	375	0	136	0	17	0	97	47	422	7	185	0	0	45	35	0	688
Tri City South	5	449	0	246	0	12	0	123	101	555	215	764	0	0	1	72	3	1,026
Lane Judd Subwatershed	5	827	84	820	0	29	0	220	148	1,009	916	1,574	6	94	46	107	3	1,750
Clark Branch	0	338	0	406	0	16	0	542	0	0	248	1,045	0	98	0	0	6	1,301
Van Dine	0	66	15	350	0	0	0	0	106	145	84	1,915	11	85	0	0	0	13
Willis Creek	1	175	169	726	0	63	0	8	0	0	14	109	0	0	0	0	1	248
Willis Vandine Subwatershed	1	579	184	1,482	0	79	0	550	106	145	346	3,069	11	183	0	0	0	0
Middle South Umpqua WAU	9	2,216	271	3,247	0	198	0	1,281	254	1,161	1,279	4,722	17	277	46	107	11	4,376

Map 15. Middle South Umpqua Watershed Analysis Unit
Soils of Management Concern



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- Drainages
- Subwatershed
- Section Lines
- BLM Administered Lands

Soils of Concern

- Conglomerate Soils
- Floodplain Soils
- Granitic Soils
- Hydric Soils
- Serpentine Soils
- Serpentine/Somewhat Poorly Drained (SWP) Soils
- Somewhat Poorly Drained (SWP) Soils
- Somewhat Poorly Drained/Floodplain Soils

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(2) Somewhat Poorly Drained (SWP) Soils

There are 3,247 acres of somewhat poorly drained soils on private land and 271 acres on BLM-administered land. Most of these soil types occur in the Willis Creek, Dillard, Judd Creek, Van Dine and Clark Branch Drainages. Somewhat poorly drained soils usually have a seasonal high water table within 18 inches of the soil surface and may include riparian areas and have slope stability problems. Windthrow hazards can occur more often on these soils. Hydric or wet soil areas too small for mapping (NCSS standards < 5 acres) exist as minor components within areas mapped as somewhat poorly drained.

(3) Somewhat Poorly Drained - Floodplain Soils

There are 198 acres of somewhat poorly drained - floodplain soils on private land and 0 acres on BLM-administered land. Most of these soil types occur in the Rice Creek and Willis Creek Drainages.

(4) Hydric Soils

There are 1,281 acres of hydric soils on private land and 0 acres on BLM-administered land. Most of these soil types occur in Dillard and Clark Branch Drainages. Hydric soils generally have a water table within ten inches of the soil surface for at least five percent of the growing season. The current definition of a hydric soil from the NRCS is "a soil that is sufficiently wet in the upper part to develop anaerobic conditions during the growing season." These areas have the greatest potential to be classified as wetlands.

(5) Conglomerate Soils

There are 1,161 acres of conglomerate soils on private land and 254 acres on BLM-administered land. Most of these soil types occur in the Tri City South, Tri City North and Van Dine Drainages.

When exposed to the elements, conglomerates tend to weather rapidly and unevenly. Slope stability is sometimes difficult to predict due to the variability of parent material and cementing agents. Dry ravel erosion occurs on steep slopes producing a high coarse fragment content in and on the soil surface. Droughtiness, seedling mortality, road maintenance, and sediment sources increase as dry ravel increases.

(6) Serpentine Soils

There are 4,722 acres of serpentine soils on private land and 1,279 acres on BLM-administered land. Most of these soil types occur in the Van Dine, Clark Branch, Judd Creek, and Tri City South Drainages. Serpentine soils generally have high amounts of magnesium and iron and low amounts of nitrogen, phosphorus, potassium, and molybdenum. Productivity for Douglas-fir is poor and grasses grow rapidly. Conversion from native forest vegetation to other commercial forest types is difficult. Serpentine areas are usually associated with geologic contact zones that indicate increases in ground water and decreases in slope stability.

(7) Serpentine - Somewhat Poorly Drained Soils

There are 277 acres of serpentine - somewhat poorly drained soils on private land and 17 acres on BLM-administered land. Most of these soil types occur in the Clark Branch, Van Dine, and Lane Creek Drainages.

(8) Granitic Soils

There are 107 acres of granitic soils on private land and 46 acres on BLM-administered land. Most of these soil types occur in the Tri City North and Tri City South Drainages. Granitic soils are highly susceptible to surface erosion and shallow slope failure. They have low organic carbon reserves and are not very resilient.

(9) Prime Farmland Soils

There are 4,376 acres of prime farmland soils on private land and 11 acres on BLM-administered land. Most of these soil types occur in the Tri City South, Clark Branch, Dillard, and Tri City North Drainages. Prime Farmland has the combination of soil properties, low slope gradient, growing season, and moisture supply to produce sustained high yield crops. The Farmland Protection Policy Act, published in the Federal Register, Vol. 43, No. 21, January 31, 1978, directs federal agencies to identify and take into account the adverse effects of federal programs on the preservation of prime farmland.

b. Timber Production Capability Classification (TPCC) Information, Fragile Sites

Additional soils related data determined to be significant for planning and analysis, using the Timber Production Capability Classification (TPCC), are the Fragile-Suitable and Fragile-Nonsuitable Classifications (see Table 16 and Map 16). Timber Production Capability Classification Fragile sites refer to those areas where the timber growing potential may be reduced due to inherent soil properties and landform characteristics. The Timber Productivity Capability Classification groups sites into Fragile - Suitable and Fragile - Nonsuitable for timber production classifications. Fragile - Suitable sites have the potential for unacceptable soil productivity losses as a result of forest management activities unless mitigating measures are applied to protect the soil/site productivity (see Best Management Practices, Appendix D, Roseburg District Resource Management Plan, USDI 1995). Fragile - Nonsuitable sites are considered to be unsuitable for timber production. Table 16 lists the number of acres in each classification on BLM-administered land within the WAU.

Table 16. Fragile Site Classifications on BLM administered Lands From the Timber Production Capability Classification.

Drainage	FSR	FSNW	FNR	FNNW	FGR	FGNW	FPR	FPNW	FWR	FWNW
Dillard	0	0	0	0	0	0	0	0	0	0
Kent Creek	314	0	0	0	0	0	2	1	0	0
Rice Creek	407	0	0	9	496	0	12	3	17	0
Kent Rice Subwatershed	721	0	0	9	496	0	14	4	17	0
Judd Creek	2	0	56	682	0	0	162	1	29	0
Lane Creek	23	0	33	193	0	0	0	0	0	0
Tri City North	0	15	0	15	103	0	0	0	0	0
Tri City South	0	42	2	246	0	0	0	0	0	0
Lane Judd Subwatershed	24	57	91	1,136	103	0	162	1	29	0
Clark Branch	0	15	125	136	0	0	0	0	0	0
Van Dine	0	0	65	154	35	0	0	0	0	0
Willis Creek	17	0	0	32	114	5	186	1	12	4
Willis Vandine Subwatershed	17	15	190	322	149	5	186	1	12	4
Middle South Umpqua WAU	762	72	281	1,467	748	5	362	6	58	4

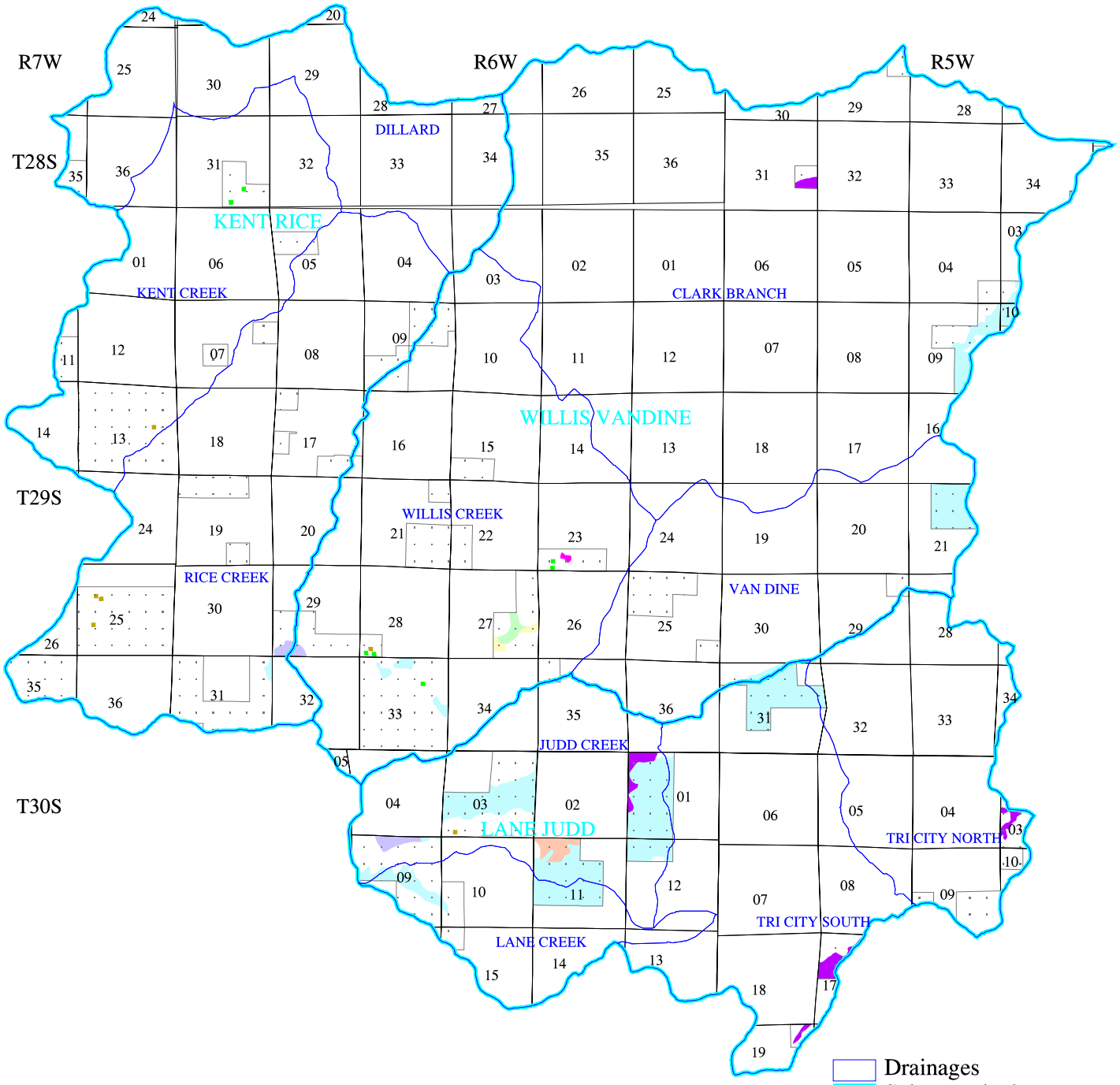
(1) Soil Moisture (FS)

Soils on these sites are typically moisture deficient due to soil physical characteristics. These sites are not considered moisture deficient due to competing vegetation or annual precipitation.

(a) Suitable (FSR)

These soils typically have loamy fine sands and sandy loam textures with high amounts of coarse fragments. They generally have between one and one and a half inches of available water holding capacity in the top 12 inches. Most of these soil types occur in the Rice Creek and Kent Creek Drainages.

Map 16. Middle South Umpqua Watershed Analysis Unit Fragile Soil Classifications from the Timber Productivity Capability Classification (TPCC)



Drainages
Subwatershed
Section Lines
BLM Administered Lands

TPCC
- FGNW
- FGSR
- FNNW
- FPNW
- FSNR
- FSNW
- FSR
- FWNW
- FWR

0 1 2 3 4 5 Miles

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(b) Nonsuitable (FSNW)

Soil textures at these sites are dominantly gravelly sands or sands. They have less than one inch of available water holding capacity in the top 12 inches. These soil types occur in the Tri City South, Tri City North, and Clark Branch Drainages.

(2) Nutrient (FN)

Soils on these sites are inherently low in nutrients or have a nutrient imbalance that inhibits tree growth.

(a) Suitable (FNR)

Forest management activities would not reduce site productivity below the threshold considered to be commercial forest land (20 cubic feet per acre per year). These soil types occur in the Clark Branch, Van Dine, Judd Creek, Lane Creek, and Tri City South Drainages.

(b) Nonsuitable (FNNW)

Forest management activities could reduce site productivity below the threshold considered to be commercial forest land of 20 cubic feet of wood production per acre per year. Most of this soil type occurs in the Judd Creek, Tri City South, Lane Creek, Van Dine, Clark Branch Drainages. The Willis Creek, Tri City North and Rice Creek Drainages have smaller amounts of these soil types.

(3) Slope Gradient (FG)

Sites classified as fragile slope gradient consist of slopes ranging from 60 to over 100 percent. These areas have a high potential for debris type landslides. Classifications are based on geology, geomorphology, physiographic position, climate (especially precipitation), soil types, and other factors.

(a) Suitable (FGR)

These sites are less fragile than the nonsuitable areas. Unacceptable soil and organic matter losses may occur on these sites from mass soil movement as a result of forest management activities unless mitigating measures (Best Management Practices) are used to protect the soil/growing site. These soil types occur in the Rice Creek, Willis Creek, Tri City North, and Van Dine Drainages.

(b) Nonsuitable (FGNW)

Unacceptable soil and organic matter losses could occur from mass soil movements as a result of forest management activities. These losses cannot be mitigated even using best management practices. The five acres of this classification occur in the Willis Creek Drainage.

(4) Mass Movement Potential (FP)

These sites consist of deep seated, slump, or earth flow types of mass movements with undulating topography and slope gradients generally less than 60 percent.

(a) Suitable (FPR)

These sites may contain soil tension cracks and/or sag ponds. Trees on these sites may be curved at the base and/or along the stem. Forest management is feasible, since the movement rate is slow. These site conditions occur in the Willis Creek, Judd Creek, Rice Creek, and Kent Creek Drainages.

(b) Nonsuitable (FPNW)

These sites have active, deep-seated, slump-earthflow types of mass movements. They include areas where soils have been removed and do not currently produce commercial forest stands. The rate of movement may result in jackstrawed trees. Forest management is not feasible on these sites due to the rate of movement. Nonsuitable Mass Movement sites are rare and usually small in size. Rice Creek, Kent Creek, Judd Creek, and Willis Creek Drainages contain small amounts of this classification.

(5) Groundwater (FW)

These soils contain water at or near the soil surface for sufficient periods of time such that vegetation survival and growth are affected.

(a) Suitable (FWR)

Conifer production is usually limited due to excessive groundwater. These sites may or may not have water tolerant species. Soils typically have high chroma mottles close to the surface. Groundwater is usually altered when the site is disturbed but the productivity loss is considered to be acceptable. Forest management activities would not reduce site productivity below the threshold of commercial forest land of 20 cubic feet of wood produced per acre per year or cause noncommercial forest land to be converted to nonforest land. These soil types occur in the Judd Creek, Rice Creek, and Willis Creek Drainages.

(b) Nonsuitable (FWNW)

Water tolerant tree and understory species grow on these sites. Commercial conifer survival and productivity are severely limited due to excessive groundwater. Soils typically have dark colored surface horizons and low chroma mottles at or near the surface. Groundwater is altered when the site is disturbed and results in unacceptable productivity losses and/or the loss of water tolerant tree species. Forest management activities could reduce site productivity below the threshold of commercial forest land (20 cubic feet of wood produced per acre per year) or cause noncommercial forest land to be converted to nonforest land. Willis Creek contains four acres of this classification.

VI. Hydrology

A. Introduction

The Middle South Umpqua Watershed Analysis Unit (WAU) is 92.8 square miles in size. The Roseburg BLM District does not have any Memorandum of Understanding for municipal water use within this WAU.

Much of the land along the South Umpqua River is used for agricultural purposes. In the agricultural areas many of the tributaries to the river have been straightened or had their flow patterns altered. Most of the native vegetation has been replaced with low growing vegetation, such as grasses. Riparian areas may have deciduous trees along the banks of the streams.

The higher elevations are a combination of Federally-administered and private timber lands. Logging and road construction have affected channel complexity, water quality, and hydraulic processes.

B. Climate

The Middle South Umpqua Watershed Analysis Unit has a Mediterranean type of climate characterized by cool, wet winters and hot, dry summers. Most of the precipitation occurs as rainfall. However, the higher elevations could receive a significant amount of snowfall. There are no weather stations within this WAU. The closest available stations were used to characterize the climate (see Table 17).

Table 17. Weather Station Data Used to Characterize Precipitation in the Middle South Umpqua Watershed Analysis Unit.

Weather Station Name	Station Number	Elevation (feet)	Period of Record (water year)	Mean Water Year Precipitation (inches)
Flournoy Valley	352974	700	1979-1998	46
Lookingglass	355026	620	1979-1998	39
Reston	357112	890	1956-1998	52
Riddle	357169	680	1949-1998	32
Upper Olalla	358788	760	1979-1998	41

The Riddle weather station is being used to characterize both temperature and precipitation in the WAU. Riddle is a National Oceanic and Atmospheric Administration (NOAA) weather station located about one mile south of the WAU. The other stations listed in Table 17 are located within six miles of the WAU and are precipitation measuring stations operated by Douglas County. These stations are considered to be

representative of the amount of precipitation the WAU would receive at a similar elevation. The Riddle weather station is being used to characterize climate in the WAU since it has a long period of record and temperature data were not collected at the other sites. Differences in precipitation and temperature would be expected to occur throughout the WAU due to the topography. Precipitation is influenced by elevation and the distance from the Pacific Ocean.

Mean annual precipitation from 1961 to 1990 at the Reston weather station was 51 inches and 31 inches at the Riddle weather station (Owenby and Ezell 1992). The data in Table 17 shows the amount of precipitation that could be expected based on elevation and location within the WAU. Areas closer to the coast would be expected to receive more precipitation. Annual precipitation in the WAU probably ranges from about 30 inches near Dillard to 70 inches in the highest elevations. Chart 3 shows the range and variability precipitation of at the Riddle weather station since 1914. About 85 percent of the annual precipitation occurs from October through April. Summer precipitation averages about five inches at the Reston weather station and four inches at the Riddle weather station (see Chart 4).

Chart 3. Water Year Precipitation at the Riddle Weather Station from 1914 to 1998.

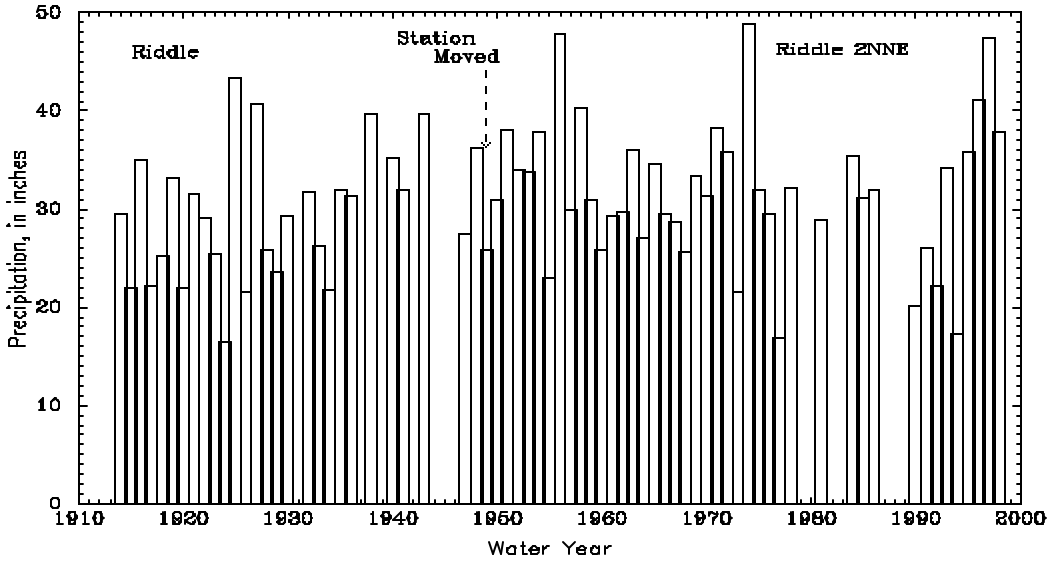
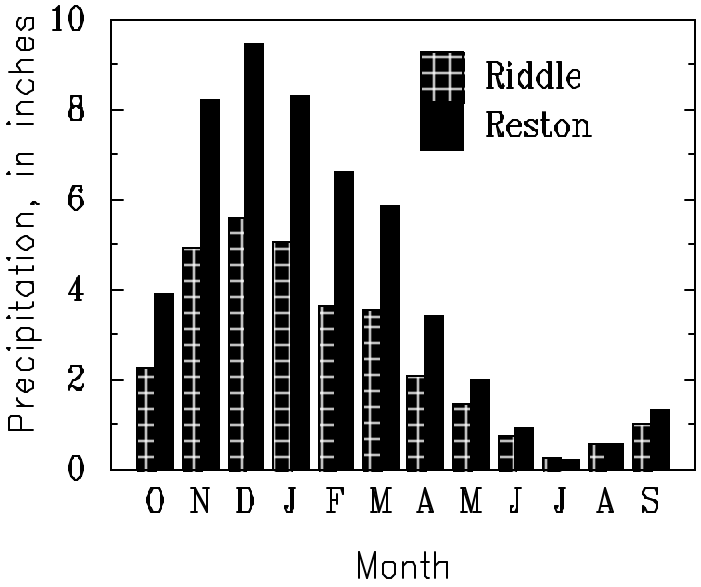


Chart 4. Comparison of Monthly Water Year Precipitation at the Reston and Riddle Weather Stations from 1961 to 1990 (Owenby and Ezell 1992).



Seven-day maximum air temperatures at the Riddle weather station are shown in Graph 1. Graph 1 compares the 1998 daily maximum air temperatures with daily mean temperatures between 1949 and 1998 and two standard deviations from the daily mean temperatures. The data could be used to evaluate stream temperatures as they relate to water quality limiting criteria.

Streams exceeding the seven-day maximum temperature of 64 degrees Fahrenheit are considered to be water quality limited, except when air temperatures exceed the 90th percentile. Two standard deviations are at the 95th percentile. Plotting stream temperature data with Graph 1 can help determine if stream temperatures greater than 64 degrees Fahrenheit may be due to abnormally high air temperatures. On July 29, 1998 and from September 2 to September 7, 1998 air temperatures exceeded or nearly exceeded the mean seven-day maximum air temperature plus two standard deviations. If stream temperatures exceeded 64 degrees Fahrenheit only on days when the air temperatures were considered to be abnormally high (greater than two standard deviations higher than the mean seven-day maximum air temperature) the stream would not be included on the water quality limited list. All listed streams could be evaluated using this type of information.

Graph 1. Comparison of 1998 Seven-day Maximum Air Temperatures With Mean Temperature Data From 1949 to 1998 and Mean Temperature Data Plus Two Standard Deviations.

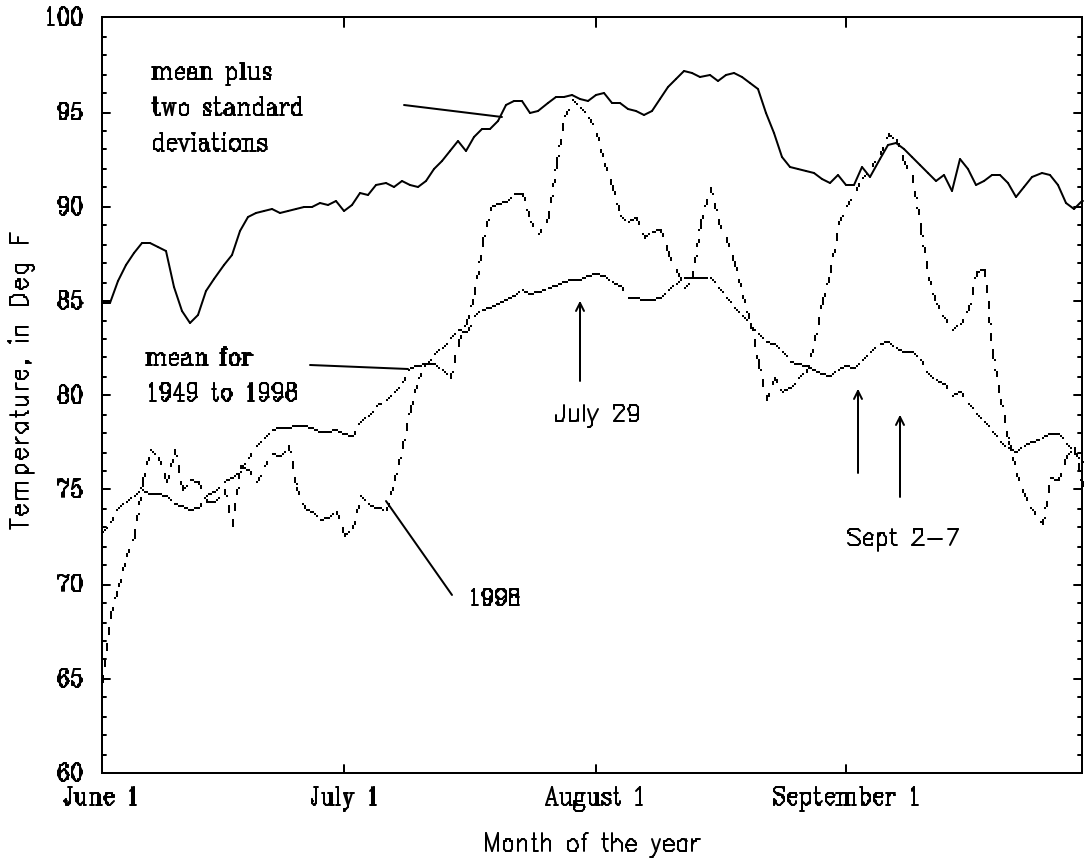
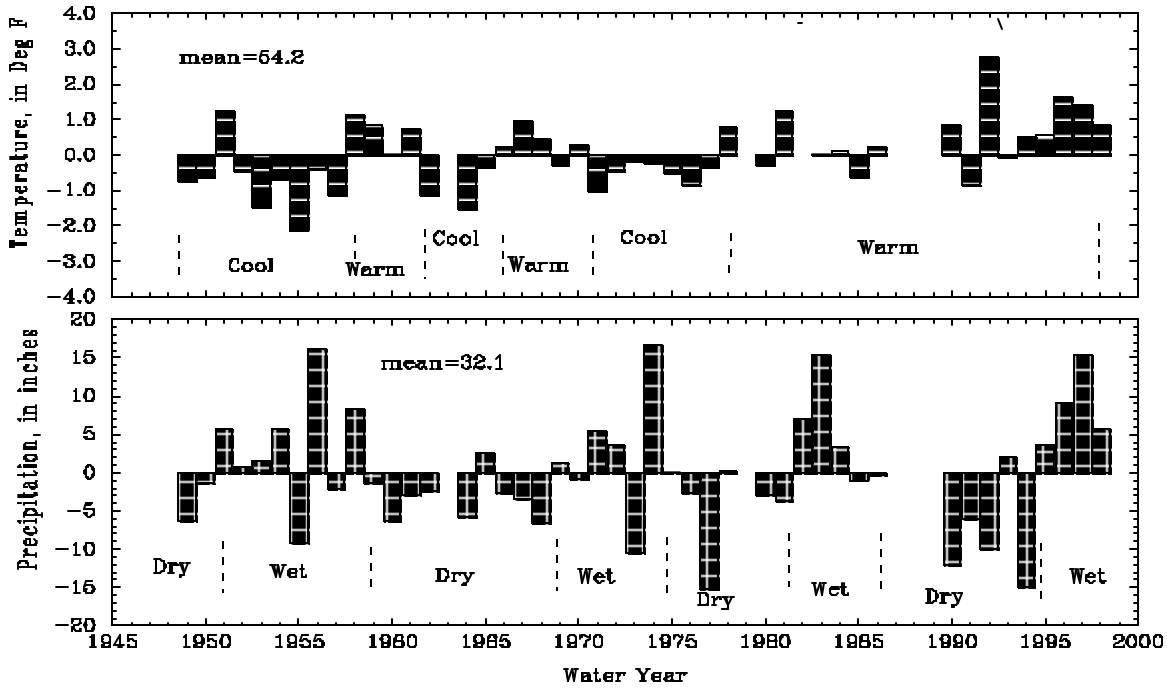


Chart 5 shows the deviation from the mean of water year temperature and precipitation from 1949 to 1998 at the Riddle weather station. Years without at least 350 daily observations were not included and are shown by gaps in the data. Average temperature was 54 degrees Fahrenheit and average precipitation was 32 inches. Chart 5 also shows a qualitative ranking of the climate as being cool or warm and wet or dry. The climate has been mostly warm since 1978 and wet since 1995.

Chart 5. Annual Temperature and Precipitation Deviations From the Mean From 1949 to 1998 at the Riddle Weather Station.



C. Streamflow

There are no gaging stations within the Middle South Umpqua WAU. In general, stream flows follow the precipitation pattern with higher flows in the winter and lower flows in the summer. Most streamflow occurs from November through May with the maximum in January. Some streams may not flow for probably up to a week during August in normal years. In dry years, streams may not flow for a few days in July or September. Generally, when a stream reach is dry the water flows underground for a short distance then resurfaces downstream. Fourth order and larger streams in the WAU probably flow year round.

Summer low flows may be affected by human water withdrawals. Most streams in the higher elevations of the WAU are not impacted by irrigation withdrawals. However, water is used for road maintenance and fire protection. An inventory of water right in 1996 listed 323 appropriated permits totaling approximately 53 cubic feet per second (cfs) of streamflow within the WAU. The water is used for a variety of purposes including domestic water use, irrigation, livestock water use, and fire protection. The restrictions on these water rights are not known. Domestic water withdrawal, irrigation, agriculture, and livestock water use contribute to the lower summer flows. Water withdrawn during the summer may decrease available habitat for aquatic life and increase summer water temperatures and pH simply because less water is in the stream.

The United States Geological Survey (USGS) method of estimating floods could be used to estimate the magnitude and frequency of floods for ungaged streams in the WAU. The information could be used to determine the size of culverts to install on a particular stream. The area of lakes and ponds, precipitation intensity, and drainage area are information required to be able to use the USGS method (Harris et al., 1979). The area of lakes and ponds may be insignificant in many of the drainages in the WAU. Precipitation intensity is the maximum 24-hour rainfall having a recurrence interval of two years. Precipitation intensity can be determined using a map prepared by the National Oceanic and Atmospheric Administration (NOAA 1973). The estimated precipitation intensity ranges from three inches in the lower elevations to four inches in the higher elevations of the WAU.

D. Roads

Timber harvesting and road building can potentially contribute to increased peak flows above normal rates, add sediment to the stream, increase the risk of landslides, increase stream temperature, and change stream channel morphology (Beschta 1978, Harr and McCorison 1979, Jones and Grant 1996, and Wemple et al. 1996). Although many of these impacts can be mitigated or lessened with improved management techniques, past practices would continue having some impacts on the hydrology in the WAU.

Road densities in the WAU range from 3.86 to 5.74 miles per square mile (see Table 18). The average road density in the WAU is 4.67 miles per square mile. There are approximately 1,198 stream crossings in the WAU. Approximately 114 of the stream crossings are on BLM-administered land. Stream crossing densities range from 1.34 crossings per stream mile in the Dillard Drainage to 2.69 crossings per stream mile in the Tri City South Drainage. The average number of stream crossings per stream mile in the WAU is 2.06.

Roads have the potential to increase peak flows by delivering water to the stream channel faster than in a non-roaded landscape. Roads can also increase the stream drainage network by routing water into culverts, which if not properly located can cause gullying, effectively acting as another stream channel (Wemple et al. 1996). Increased sedimentation from roads can occur if culverts drain onto unstable or erosive slopes or if too few culverts are placed along the road eroding the ditchline.

Drainages with the most stream crossings and subsequently the most culverts would have the greatest risk of culverts failing or becoming blocked during storm events. Blocked or failed culverts can increase erosion, road failures, or debris slides. Culverts can influence the stream channel by limiting stream meandering, changing stream gradient, limiting bedload movement, and increasing sediment. A limited number of the culverts in the WAU have been inspected and/or maintained. The Resource Management Plan (RMP) states new culverts should accommodate a 100-year flood event.

Table 18. Mile of Roads and Streams, Stream Crossings, and Densities in the Middle South Umpqua WAU.

Drainage Name Subwatershed Name	Acres	Square Miles	Miles of Roads	Road density (miles per square mile)	Miles of Streams	Stream density (miles per square mile)	Stream Crossings per Stream Mile
Dillard	4,069	6.36	27.95	4.39	31.43	4.94	1.34
Kent Creek	4,921	7.69	30.10	3.91	50.54	6.57	1.70
Rice Creek	7,930	12.39	60.74	4.90	73.96	5.97	2.31
Kent Rice Subwatershed	16,920	26.44	118.79	4.49	155.93	5.90	1.92
Judd Creek	3,663	5.72	22.38	3.91	42.02	7.35	1.74
Lane Creek	1,940	3.03	11.70	3.86	20.05	6.62	2.19
Tri City North	3,794	5.93	31.98	5.39	39.22	6.61	1.99
Tri City South	4,797	7.50	43.07	5.74	36.42	4.86	2.69
Lane Judd Subwatershed	14,194	22.18	109.13	4.92	137.71	6.21	2.13
Clark Branch	14,919	23.31	96.11	4.12	141.50	6.07	2.00
Van Dine	4,741	7.41	36.23	4.89	49.20	6.64	2.38
Willis Creek	8,622	13.47	73.53	5.46	96.20	7.14	2.14
Willis Vandine Subwatershed	28,282	44.19	205.87	4.66	286.90	6.49	2.11
Middle South Umpqua WAU	59,396	92.81	433.79	4.67	580.54	6.26	2.06

Table 19 shows the number of miles and densities of roads on BLM-administered land within Riparian Reserves and within 100 feet of streams. About 14 miles of roads are located within Riparian Reserves and almost seven miles of road are within 100 feet of a stream. Roads within 100 feet of a stream are more likely to add sediment to the stream, since the limited amount of vegetation between the road and stream cannot capture the sediment before it reaches the stream.

Many roads in the WAU are in need of some maintenance. Maintenance needing to be performed may include removing slides blocking ditchlines or culverts or installing additional cross drain culverts and/or waterbars on the roads to reduce the amount of runoff entering the stream channels. Installing cross drains

would disperse the water flowing in the ditchline keeping it from flowing into the stream. This would decrease the potential for larger peak flows, increase the amount of subsurface flow, and provide more sediment filtration.

Table 19. Miles of Roads and Road Densities Within Riparian Reserves and Within 100 Feet of a Stream on BLM-Administered Land in the Middle South Umpqua WAU.

	Riparian Reserves				Within 100 Feet of a Stream			
Area	Acres	Square Miles	Miles of Roads	Road Density (Miles per Square Mile)	Acres	Square Miles	Miles of Roads	Road Density (Miles per Square Mile)
Dillard	12	0.02	0	0	8	0.01	0	0
Kent Creek	345	0.54	2.03	3.76	194	0.30	1.01	3.37
Rice Creek	535	0.84	3.14	3.74	286	0.45	1.95	4.33
Kent Rice Subwatershed	892	1.39	5.17	3.72	488	0.76	2.96	3.89
Judd Creek	587	0.92	2.08	2.26	302	0.47	0.94	2.00
Lane Creek	180	0.28	0.99	3.54	102	0.16	0.48	3.00
Tri City North	107	0.17	0.17	1.00	63	0.10	0.07	0.70
Tri City South	109	0.17	0.46	2.71	58	0.09	0.10	1.11
Lane Judd Subwatershed	983	1.54	3.70	2.40	525	0.82	1.59	1.94
Clark Branch	30	0.05	0	0	18	0.03	0	0
Van Dine	190	0.30	1.44	4.80	78	0.12	0.59	4.92
Willis Creek	603	0.94	3.58	3.81	321	0.50	1.58	3.16
Willis Vandine Subwatershed	823	1.29	5.02	3.89	417	0.65	2.17	3.34
Middle South Umpqua WAU	2,698	4.22	13.89	3.29	1,430	2.23	6.72	3.01

Maintenance needs may also include grading roads to reduce the amount of water flowing in ruts on the road. Water in a rut may flow past several culverts carrying sediment from the road surface into a stream. Mulching bare cutbanks and fill slopes and limiting access to unsurfaced roads in the wet season could also decrease surface erosion and minimize the amount of sediment flowing into streams due to the roads.

Roads within the WAU causing water quality problems could be improved or fully decommissioned. Unsurfaced, spur, and jeep roads that need maintenance, improvements, or could be fully decommissioned exist in many sections of BLM-administered land within this WAU. Table 20 lists the areas within the WAU where roads could be fully decommissioned, if possible, or improved to reduce water quality problems. The main water quality problems observed in the WAU were erosion and sedimentation, culverts restricting the stream causing excessive downcutting in the channel, and roads restricting the natural meandering of streams.

Table 20. Location of Roads Contributing to Water Quality Problems in the Middle South Umpqua WAU.

Township	Range	Section
29 S	5W	3, 19, and 30
29 S	6 W	24, 25, 28, 29, 31, 33, and 34
29 S	7 W	13 and 35
30 S	5 W	3
30 S	6 W	3, 9, and 15

E. Peak Flows

Timber harvesting and road building within the Transient Snow Zone (TSZ) can result in increased peak flows during warm rain-on-snow events. The Transient Snow Zone (TSZ) is defined as land between 2,000 and 5,000 feet in elevation. Harr and Coffin (1992) noted that snow stored under a forest canopy of at least 70 percent crown closure was less susceptible to rapid snowmelt than snow in openings. Increased peak flows following timber harvesting in the TSZ could lead to an increase in landslides and erosion (Harr 1981).

Hydrologists on the Umpqua National Forest developed the Hydrologic Recovery Procedure (HRP) to evaluate the cumulative effects of timber harvesting in the Transient Snow Zone (USFS 1990). The Middle South Umpqua WAU is characterized as having a rain dominated precipitation regime. However, peak flows occurring in some of the drainages could be affected by rain-on-snow events. Most of the WAU is below 2,000 feet in elevation. About ten percent of the WAU is area above 2,000 feet in elevation (see Table 21). The Judd Creek and Willis Creek Drainages have the largest number of acres in the TSZ. Although, Judd Creek is the only drainage with more than 50 percent in the TSZ.

Judd Creek, Rice Creek, Clark Branch, Willis Creek, and Lane Creek Drainages each have more than 250 acres of BLM-administered land within the TSZ. However, all of the drainages in the WAU have HRPs greater than 96 percent simply because most of the WAU is below the TSZ. The HRP assumes the area below 2,000 feet in elevation is 100 percent recovered.

Table 21. Number of Acres and Percent of Drainage in the Transient Snow Zone Acres in the Middle South Umpqua WAU.

Drainage Name **Subwatershed Name**	Acres in the Transient Snow Zone		Percent of Total Acres in the WAU
	BLM	Total	
Dillard	0	0	0
Kent Creek	0	1	0
Rice Creek	296	532	7
Kent Rice Subwatershed	296	533	3
Judd Creek	452	1,979	54
Lane Creek	250	526	27
Tri City North	14	29	1
Tri City South	48	265	6
Lane Judd Subwatershed	763	2,800	20
Clark Branch	280	825	6
Van Dine	71	793	17
Willis Creek	347	1,134	13
Willis Vandine Subwatershed	698	2,752	10
Middle South Umpqua WAU	1,757	6,085	10

Approximately 26 percent of the BLM-administered land in the WAU has been harvested in the past 30 years (see Table C-1 in Appendix C). Most drainages in the WAU have had at least 30 percent harvested within the last 30 years on both private and BLM managed land. Drainages with high road densities, high stream crossing densities, a large portion area in the TSZ, and a large percentage harvested within the last 30 years may be susceptible to increased peak flows. During rain-on-snow events, water is routed to the streams faster because snow accumulation is greater in recently harvested units. Management activities, such as regeneration harvests and road building, may magnify the effects of increased peak flows in drainages with these conditions.

Roads have been found to extend the stream network 60 percent over winter base flow stream lengths and 40 percent over storm event stream lengths (Wemple 1994). Road densities were 1.6 miles per square mile in Wemple's study area. Road densities in the Middle South Umpqua WAU average 4.7 miles per square mile (see Table 18). However, road densities may be higher since all roads are may not be on GIS. Roads may increase winter peak stream flows in the WAU. The majority of roads within the WAU are

constructed with ditches and/or insloped road surfaces designed to carry water off of the road surface. Once it is in the ditch, much of the water reaches the local stream channel faster than in an unroaded area. In fact, some ditchlines effectively function as stream channels extending the actual length of flowing streams during rain storms. Increased drainage density due to road construction may increase peak flows and mean annual floods. Drainages with fewer streams per square mile experience higher winter peak flows as a result of roads than drainages with a lot of streams. Fewer streams to handle the rapid runoff increase streamflow, potentially leading to down cutting, bank failures, bed scouring, and mass wasting where streams undercut adjacent slopes. The dominant factor affecting peak flow in smaller drainages is how quickly the water gets to the stream channel. Tractor harvesting usually compact soils, adding to the surface runoff.

F. Stream Channel

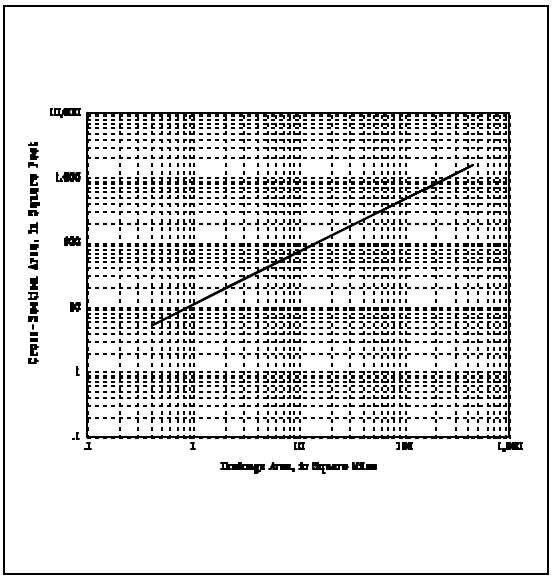
There are approximately 581 miles of streams in the Middle South Umpqua WAU. Stream density is about 6.26 miles of streams per square mile (see Table 18). Stream (or drainage) density can be an indication of erosion potential. A higher stream density allows the streamflow to respond quicker to rainfall (Chow 1964). Drainages with higher stream densities can be expected to erode soils easily and produce steep slopes.

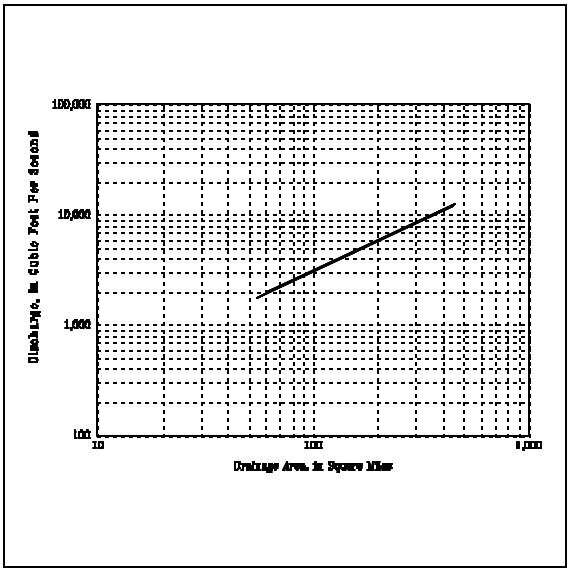
The Rosgen stream classification method was used to characterize channel morphology for streams reaches in the WAU. The Level I characterization used topographic maps and aerial photographs to delineate stream types based on gradient and sinuosity (Rosgen 1996). For this watershed analysis only stream gradient, determined by using GIS, was used to characterize streams in the WAU, except in areas where 20-foot contour data were not available. Channels tend to be steeper in the upper reaches and flatter in the lower reaches. Results of the Rosgen Level 1 classification are presented in Table D-1 in Appendix D.

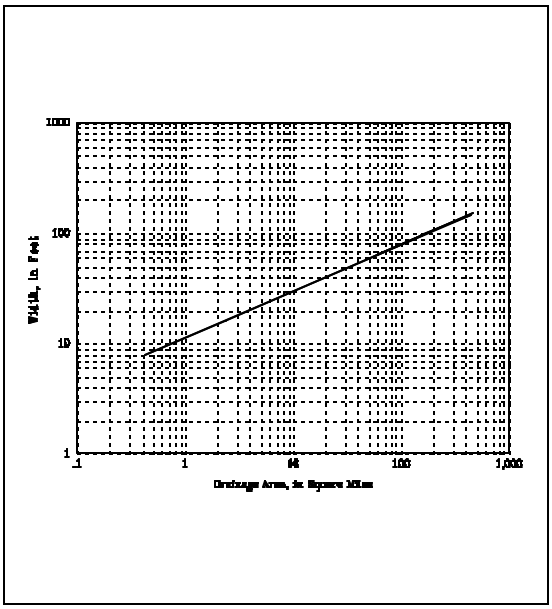
The Rosgen Classification can be used as an indicator to determine stability, sensitivity to disturbance, recovery potential, sediment supply, streambank erosion potential, and the influence of the vegetation on the stream channel (Rosgen 1994). Streams may be divided into sediment source, transport, and depositional areas based on the slopes or gradient of the stream channels. High gradient streams (A and Aa+) are source areas for debris torrents. Medium gradient streams (B) are transport areas that do not change significantly with time. It is presumed medium gradient streams are lacking in large woody debris (LWD). Sediment passes through medium gradient streams rather than being deposited. Low gradient streams (C or F) are the most likely stream type to change due to deposition and erosion of sediments. Low gradient streams provide the best quality fish habitat because they have meanders, under cut banks, deep pools, large woody debris, and gravel tends to accumulate in these reaches. Many low gradient stream channels in the WAU have been eroded down to bedrock, probably due to increased peak flows as a result of timber harvesting and road construction, channel downcutting due to overgrazing on streambanks, and the lack of LWD due to stream cleaning practices.

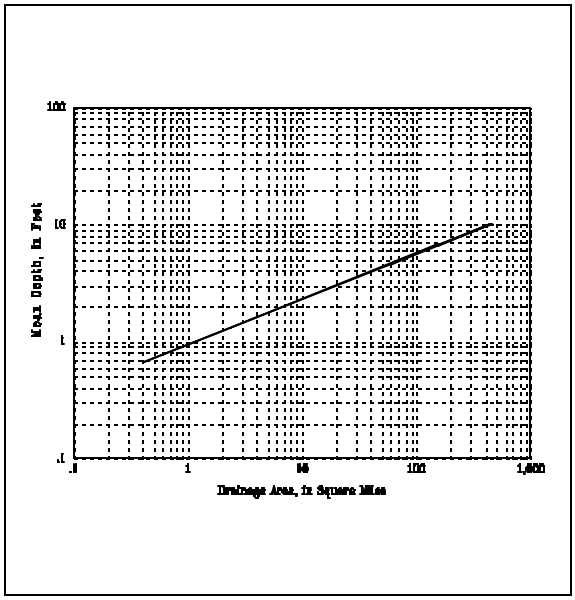
Level I classification is a first look at determining stream types. Level II through IV classifications require field surveys to determine priorities for restoration, potential for changes in stream morphology due to management activities, and design restoration projects. Development of regional curves under the Level II classification can be used to predict streamflow, depth, width, and cross-sectional area of ungaged streams. Graph 2 shows regional curves developed using the Level II classification.

Graph 2. Regional Curves for the South Umpqua River Basin Using Drainage Area to Estimate Bankfull Cross-sectional Area, Discharge, Mean Depth, and Width.









G. Proper Functioning Condition Surveys

A Proper Functioning Condition (PFC) survey was conducted on about a 3/4 mile reach of Rice Creek in 1997. The PFC survey was conducted using methods from Barrett et al. (1995). The surveyed reach, located in T29S, R7W, Section 25, was determined to be non-functioning and a Rosgen stream channel type G. The Proper Functioning Condition survey notes mentioned problems associated with channelization, road encroachment on the stream channel, and upstream channel conditions. The PFC survey notes indicated the problems could be corrected by the BLM.

Restoration activities could be conducted in the area where the PFC survey noted problems. However, higher priority restoration sites in the WAU may be identified during site specific analyses.

H. Water Quality

1. Standards by Law and Beneficial Uses

The Federal Clean Water Act of 1972, Section 303(d), directs each state to identify streams which do not meet water quality standards. The objective of the Clean Water Act of 1977 is to restore and maintain the chemical, physical, and biological integrity of the nations' waters (Bureau of National Affairs 1977). Water quality would be managed to protect and recognize beneficial uses. The Oregon Department of Environmental Quality (DEQ) monitors water quality conditions of the streams in Oregon.

The Oregon Administrative Rules Antidegradation Policy (OAR 340-41-026) is to prevent unnecessary degradation from point and nonpoint sources of pollution, protect, maintain, and enhance existing surface water quality, and protect all existing beneficial uses. The Oregon Administrative Rules (OAR 340-41-282) set the Standards to be used in the Umpqua River Basin. Beneficial Uses for surface waters in the Umpqua River Basin include public and private domestic water supplies, industrial water supply, irrigation, livestock watering, anadromous fish passage, salmonid fish rearing, salmonid fish spawning, resident fish and aquatic life, wildlife, hunting, fishing, boating, water contact recreation, aesthetic quality, and hydroelectric power.

The Oregon DEQ water quality parameters and their affected beneficial uses are listed in Table 22. The criteria used to list a stream as water quality limited are in Listing Criteria for Oregon's 1998 303(d) List of Water Quality Limited Water Bodies (Oregon Department of Environmental Quality 1998).

Kent, Lane, and Rice Creeks were listed as water quality limited in 1998 due to habitat modifications (Oregon Department of Environmental Quality 1998). The habitat modifications included the lack of LWD and pool frequency.

Table 22. Water Quality Parameters and Beneficial Uses.

Water Quality Parameter	Beneficial Uses Affected
Aquatic Weeds or Algae	Water Contact Recreation, Aesthetics, Fishing
Bacteria (E. coli) or Fecal Coliform	Water Contact Recreation
Biological criteria	Resident Fish and Aquatic Life
Chlorophyll a	Water Contact Recreation, Aesthetics, Fishing, Water Supply, Livestock Watering
Dissolved Oxygen	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Habitat Modification	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Flow Modification	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Nutrients	Aesthetics or use identified under related parameters
pH	Resident Fish and Aquatic Life, Water Contact Recreation
Sedimentation	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Temperature	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Total Dissolved Gas	Resident Fish and Aquatic Life
Toxics	Resident Fish and Aquatic Life, Drinking Water
Turbidity	Resident Fish and Aquatic Life, Water Supply, Aesthetics

Table 23 shows water quality data for the South Umpqua River, between Roberts Creek and Days Creek, from the 1998 303(d) list (Oregon Department of Environmental Quality 1998). The WAU is included within this portion of the South Umpqua River. Existing and readily available water quality data must be used to list a stream as water quality limited. Data sources may include the State's Water Quality Status Assessment 305(b) Report, dilution calculations or predictive models indicating nonattainment of standards, water quality problems reported by other agencies, institutions, or the public, and the State's nonpoint assessments submitted to the Environmental Protection Agency (EPA) under Section 319 of the Clean Water Act (Oregon Department of Environmental Quality 1996).

Table 23. Water Quality Limited Parameters of the South Umpqua River from Roberts Creek to Days Creek.

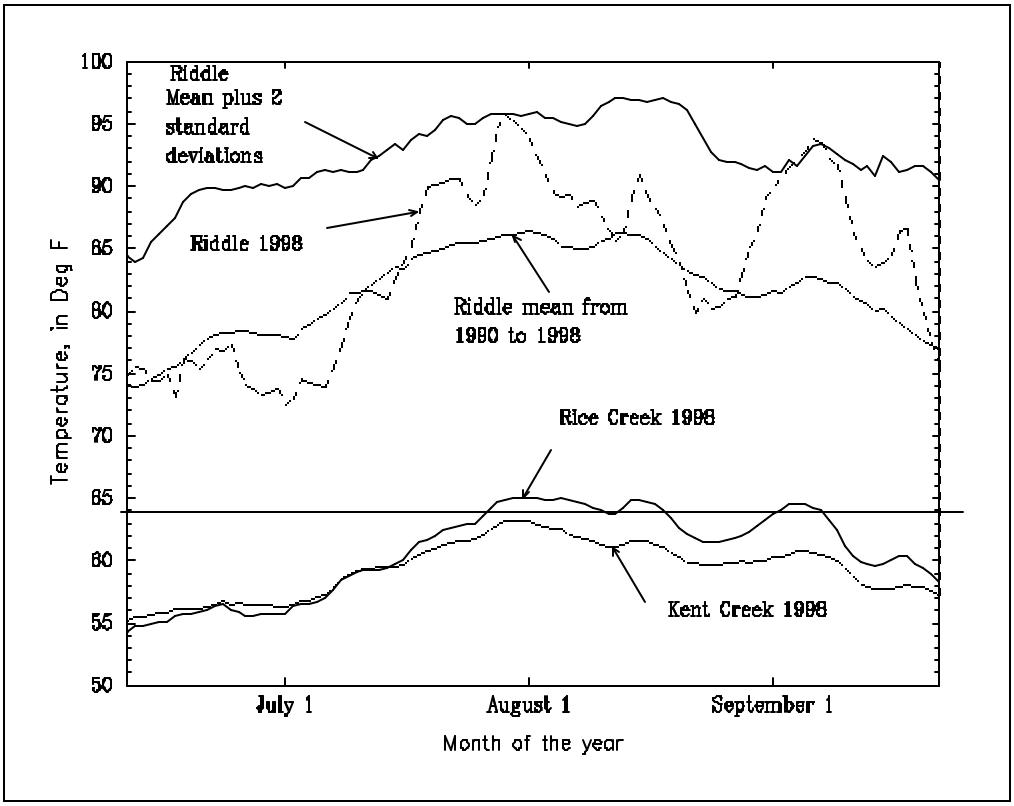
Parameter	Listing Criteria	Season	Beneficial Uses Affected
Aquatic weeds or algae	Periphyton	Summer	Water contact recreation, aesthetics, fishing
Bacteria	1996 Standard for fecal coliform	Entire Year	Water contact recreation
Biological Criteria			Resident fish and aquatic life
Dissolved Oxygen (DO)	Cool-water aquatic resources: DO Less Than 6.5 mg/l	May 1 - October 31	Resident fish and aquatic life, salmonid spawning and rearing
pH	Less Than 6.5 or Greater Than 8.5	Summer	Resident fish and aquatic life, water contact recreation
Temperature	Greater Than 64 Degrees Fahrenheit	Summer	Resident fish and aquatic life, salmonid spawning and rearing

2. Stream Temperature

Stream temperature is one of the most important water quality parameters monitored in the WAU. Stream temperature affects resident fish and aquatic life and salmonid fish spawning and rearing. Currently, streams with salmonids meet the Oregon DEQ water quality stream temperature criteria when maintained at or below 64 degrees Fahrenheit (17.8 degrees Celsius) for the seven-day moving average daily maximum temperature. The South Umpqua River from the mouth to the headwaters is on Oregon's Final 1998 Water Quality Limited Streams 303(d) list.

The Roseburg BLM District collected stream temperature data on Rice and Kent Creeks in 1998. The streams monitored were in the headwaters of the WAU. The seven-day maximum water temperatures for these two sites were compared to the seven-day maximum air temperature at the Riddle Weather Station in Graph 3. The stream temperatures followed the same pattern as the air temperatures. Rice Creek had temperatures greater than 64 degrees Fahrenheit during part of the summer and is considered to be water quality limited. Kent Creek had temperatures less than 64 degrees Fahrenheit during the entire summer and is not considered to be water quality limited.

Graph 3. Comparison of 1998 Seven-day Maximum Air and Water Temperatures With Mean Temperature Data From 1949 to 1998 and Mean Temperature Data Plus Two Standard Deviations.



3. pH

The pH standard set by DEQ for the Umpqua River Basin is 6.5 to 8.5. MacDonald et al. (1990) found pH levels less than 6.5 and greater than 9 can have adverse affects on fish and aquatic insects. However, non-lethal affects of suboptimum pH levels on fish are not known.

The Little River Watershed Analysis (USDA and USDI 1995) reported algae accumulations in streams can affect pH. The process of photosynthesis by aquatic organisms uses dissolved carbon dioxide and consumes H+ ions during the daylight hours, raising pH levels (more alkaline). Respiration by aquatic organisms at night releases carbon dioxide, decreasing pH levels. Diurnal algae-driven pH cycles in Little River were found to range from 7.8 in the morning to 9.1 in the late afternoon. Photosynthesis does not occur as much in shaded stream reaches or on cloudy days and subsequently pH levels are lower. Maximum pH values of 9.0 may occur in streams not affected by pollution (Hem 1985).

One pH sample collected by the BLM on Willis Creek found the pH within the normal range. On Rice Creek, pH data collected every half-hour from August 23, 1999 to August 27, 1999 showed diurnal fluctuations from 7.1 to 7.5. This is considered to be within the normal pH range. The BLM did not collect other pH data in the WAU. However, the DEQ listed the South Umpqua River as water quality limited for pH based on the data it collected (see Table 23).

4. Dissolved Oxygen

Dissolved oxygen (DO) is required for resident fish and aquatic organism survival and salmonid spawning and rearing. The Oregon Department of Environmental Quality set minimum DO standards at 6.5 mg/l for cool-water aquatic resources, which became effective July 1, 1996. The DEQ standards state greater than ten percent of the samples must exceed the standard with at least two samples per season to meet water quality limited criteria. The minimum DO standards for salmonid spawning streams were set at 11 mg/l, except where barometric pressure, altitude, and naturally occurring temperatures preclude attainment of the standard, then DO levels should not be less than 95 percent saturation. The minimum DO standards for cold water aquatic resources were set at 8 mg/l, unless the same conditions as mentioned for salmonid spawning streams are present, then the DO levels should not be less than 90 percent saturation.

The BLM collected one DO sample from Willis Creek. The sample was less than the minimum DO water quality limited standard. However, more samples would need to be collected before Willis Creek is listed as water quality limited for DO. On Rice Creek, DO data collected every half-hour from August 23, 1999 to August 27, 1999 showed diurnal fluctuations from 4.4 to 9.4 mg/l. The data was less than the minimum DO water quality limited standard. Rice Creek would be considered water quality limited for DO and probably would be listed in the future. Stream flows in Rice Creek were very low and estimated to be about 0.05 cubic feet per second on August 27, 1999 when the recording instrument was removed from the stream. The low stream flows would contribute to the low DO measurements. The South Umpqua River was listed as water quality limited due to DO by DEQ (see Table 23).

5. Turbidity and Sedimentation

Turbidity is a function of suspended sediments and algal growth in a stream. Turbidity varies naturally from stream to stream depending on geology, slope stability, rainfall, and temperature. No more than a ten percent cumulative increase in stream turbidities is allowed, as measured relative to a control point upstream of the turbidity causing activity. High turbidity levels can impact salmonid feeding and fish growth (McDonald et al. 1990). Turbidity may also impact drinking water quality, and recreational and aesthetic uses of water. Turbidity reduces the depth sunlight penetrates, altering the rate of photosynthesis, and impairs a fish's ability to capture food. Turbidity increases with, but not as fast as, suspended sediment concentrations. Turbidity data have not been collected by the BLM in the WAU. The DEQ did not identify any problems with turbidity.

Roads have the potential to affect the sediment regime. Erosional effects can occur when culverts become plugged or cannot handle peak flows, diverting streams out of the original channel, flowing down the road, and entering another stream channel. Road surfaces erosion varies greatly with the type and amount of traffic, season of use, and the type and quality of road surfacing material (Reid and Dunne 1984). The types of road-related surface erosion were not quantified for this analysis. It is suggested as a future data need. The quantity of sediment associated with mass wasting and potential stream crossing failures needs to be evaluated. Sediment data have not been collected by the BLM in this WAU.

6. Trace Metals

Trace metals should not be introduced into waters of the state in amounts, concentrations, or combinations above natural background levels, which may be harmful, may chemically change to harmful forms in the environment, or may accumulate in sediments or bioaccumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare, aquatic life, wildlife, or other designated beneficial uses. Trace metals water quality criteria should not exceed the criteria established for the various metals by the Environmental Protection Agency (EPA)(Environmental Protection Agency 1986). Trace metals data were not collected in the WAU. Collecting trace metals data is probably not necessary because heavy metal outcrops do not occur in the WAU and mining activity has been limited to placer mining in the South Umpqua River, if any mining activity occurred at all.

7. Nitrogen

Forest fertilization can impact water quality by increasing nitrogen levels in streams. Nitrogen in streams can lead to an increase in primary productivity, particularly algal blooms. The accumulation of algae in streams may affect pH. Aquatic organisms release carbon dioxide at night causing the stream pH to decrease. During the day aquatic organisms use carbon dioxide and hydrogen during photosynthesis causing the stream pH to increase. Aquatic organism respiration can lead to large changes in pH between night and day. Studies have measured less than 0.5 percent of the total nitrogen applied reached streams with adequate buffers, whereas two to three percent of the applied nitrogen was measured in streams with inadequate or no buffers (Moore 1975). Water quality data was collected from Willis Creek in conjunction with a forest fertilization project in 1997. Nitrogen levels did not increase in Willis Creek after forested stands were fertilized.

I. Groundwater

Groundwater in the Winston area (just north of the WAU) is chemically diverse in character (Robison and Collins 1978). There is no definite pattern in chemical character. Waters with high concentrations of dissolved solids are more likely to be found near the contacts of the basalt members and the sandstone and siltstone member of the Umpqua Formation. The Tyee Formation is not characterized by a single type of water but high concentrations of dissolved solids are not common. Average water temperature reported

by drillers was about 54 degrees Fahrenheit, the same as the mean annual air temperature at the Riddle weather station.

J. Interpretation

Many drainages in the WAU have been impacted by human activities. Agricultural uses can have a negative impact on streams. Removing water for irrigation and riparian vegetation can lead to decreased flows and increased stream temperatures in the summer. Water quality can be negatively impacted by fertilizers increasing nutrients and livestock in riparian areas causing increased sediment in streams.

Studies have indicated roads and timber harvesting can have an effect on stream channels and the hydrology of a watershed. Roads can intercept water that would normally move through the ground as subsurface flow. The water is routed to the stream channel faster causing increases in peak flows. This means less water would be stored as groundwater to be released in the summer for supporting fish and other aquatic organisms.

The Riparian Reserve age class distribution indicates the stream channels are less complex, the substrate has been degraded, and fish habitat is poor in many areas of the WAU. Table C-1 in Appendix C shows the percentage of Riparian Reserves that contain stands at least 80 years old. Removing LWD from the stream channels and harvesting vegetation along many streams has reduced the amount of LWD available for input into stream. Timber harvesting and road building in and adjacent to riparian areas have lead to higher stream temperatures within the WAU. The Riparian Reserves would help prevent increases in stream temperatures due to timber harvesting activities on BLM-administered land.

Many roads within the WAU have not been maintained on a regular basis. The lack of routine road maintenance may lead to increased sedimentation from road surfaces, landslides from road failures, and an increased risk of culvert problems.

Limited water quality, stream temperature, and summer base flow data are available for this WAU. Collecting water quality data would provide important information. Multi-parameter instruments used to collect diurnal data would be useful to quantify changes in DO and pH throughout the day of streams in the WAU.

Rosgen Level II classification surveys would be useful to characterize stream channel morphology and to identify potential stream restoration sites. Development of regional curves under the Level II classification can be used to predict streamflow, depth, width, and cross-sectional area of ungaged streams. This information would be useful for analyzing potential changes in stream morphology due to management activities, as well as designing restoration projects.

Riparian areas would recover naturally over time. Large Woody Debris could be placed in stream channels to increase complexity and aid in the recovery of areas impacted by timber harvesting and road building. Thinning in Riparian Reserves would allow trees adjacent to the stream channels to grow and provide natural recruitment of LWD faster than without management.

VII. Species and Habitats

A. Fisheries

1. Historic Fish Use in the South Umpqua River Basin

The South Umpqua River historically supported healthy populations of resident and anadromous salmonid fish. A survey conducted by the Umpqua National Forest in 1937 reported that salmon, steelhead, and cutthroat trout were abundant throughout many reaches of the South Umpqua River and its tributaries (Roth 1937). Excellent fishing opportunities for resident trout and anadromous salmon and trout historically existed within the South Umpqua River (Roth 1937). The historical condition of the riparian zone along the upper reaches of the South Umpqua River favored conditions typical of old-growth forests found in the Pacific Northwest. Roth noted the shade component that existed along the surveyed stream reaches. The majority of the stream reaches surveyed were "arboreal" in nature, meaning "tall timber along the banks, shading most of the stream" (Roth 1937). The river and its tributaries were well shaded by the canopy closure associated with mature trees. Streambanks were provided protection by the massive root systems of these trees.

Since 1937, many changes have occurred within the South Umpqua River Basin and in the stream reaches surveyed by Roth. A comparative study conducted by the Umpqua National Forest during summer low-flows between 1989 and 1993 surveyed the same stream reaches as those in the 1937 report. The results of the study showed 22 of the 31 surveyed stream reaches were significantly different from the 1937 survey. Nineteen stream reaches were significantly wider while the remaining three stream reaches were significantly narrower. Of the eight streams surveyed within designated wilderness areas, only one stream channel increased in width since 1937. In contrast, 13 of the 14 stream segments located in areas where timber harvesting occurred were significantly wider than in 1937.

The stream widening could have resulted from increased peak flows. Peak flows typically occur due to the removal of vegetation (tree canopy) and the increase in compacted area within a watershed, especially within the Transient Snow Zone (Meehan 1991). Peak flows can introduce sediment into the channel from upslope and upstream and can also simplify the channel by rearranging instream structure. Excessive sediment delivery to streams usually changes stream channel characteristics and configuration. These stream channel changes normally result in decreasing the depth and the number of pool habitats and reducing the space available for rearing fish (Meehan 1991).

Winter steelhead and resident rainbow trout (Oncorhynchus mykiss), fall and spring chinook salmon (Oncorhynchus tshawytscha), coho salmon (Oncorhynchus kisutch), and sea-run and resident cutthroat trout (Oncorhynchus clarki) have been documented using the Middle South Umpqua WAU (see Table E-1 in Appendix E). Over the last 150 years, salmonids have had to survive dramatic changes in the environment. Streams and rivers in the Pacific Northwest have been altered through European settlement, by urban and industrial development, and by land management practices. Modifications in the landscape

and waters of the South Umpqua River Basin, beginning with the first settlers, have made the South Umpqua River less habitable for salmonid species (Nehlsen 1994).

Results from the recent Umpqua National Forest study document changes in low-flow channel widths within the South Umpqua River Basin since 1937 (Dose and Roper 1994). Land management activities (road construction and timber harvest) may have contributed to the changes in channel characteristics. These changes in channel condition may have contributed to the observed decline of three of the four anadromous salmonid stocks occurring in the South Umpqua River basin (Dose and Roper 1994).

The South Umpqua River once supported abundant populations of chinook and coho salmon, steelhead, and cutthroat trout. These species survived in spite of the naturally low streamflows and warm water temperatures that occurred historically within the South Umpqua River Basin (Nehlsen 1994). Currently, salmonid populations throughout the Pacific Northwest are declining. A 1991 status report identified a total of 214 native, naturally spawning stocks as vulnerable and at-risk of extinction (Nehlsen et al. 1991). According to this 1991 report, within the South Umpqua River, one salmonid stock is considered extinct, two salmonid stocks are at-risk of extinction, and two stocks were not considered at-risk.

Historically, steelhead runs in the South Umpqua River were strongest in the winter (Roth 1937). Currently, winter steelhead are considered to be the most abundant anadromous salmonid in the South Umpqua River (Nehlsen 1994). In 1937, Roth reported summer steelhead above the South Umpqua Falls. Summer steelhead are now considered to be extinct (Nehlsen et al. 1991).

Roth (1937) reported the principal run of chinook was in the late spring and summer. Presently, spring chinook runs are considered to be depressed by the Oregon Department of Fish and Wildlife (ODFW). The spring chinook run is considered to be at high risk of extinction (Nehlsen et al. 1991). Fall chinook are considered to be healthy by ODFW (Nehlsen 1994).

Coho salmon were considered abundant in the South Umpqua River Basin in 1972 by the Oregon State Game Commission (Lauman et al. 1972). About 4,000 fish spawned in the basin with the largest number of fish (1,450) spawning within Cow Creek. Presently, coho salmon in the South Umpqua River Basin are suffering the same declines as other coastal stocks. These declines may be due to several factors including the degradation of their habitat, the effects of extensive hatchery releases, and overfishing (Nehlsen 1994). No coho salmon were sampled within the survey area (i.e., upper stream reaches of the South Umpqua River) during the 1937 survey. A subsequent study documented the common presence of coho salmon within Jackson Creek, a major tributary to the South Umpqua River, during the summer of 1989 (Roper et al. 1994). The documentation of coho salmon using Jackson Creek qualifies this species existence in most of the South Umpqua River Basin. Coho salmon have been observed and sampled within the Middle South Umpqua WAU as well.

Sea-run cutthroat are assumed to be depressed from historic levels. The information provided in the 1937 Roth report noted cutthroat trout were common and/or abundant throughout the stream reaches surveyed

in the upper South Umpqua River Basin. There are limited historical records on cutthroat population size within the South Umpqua River.

The assumption that sea-run cutthroat trout abundance is currently below historic levels throughout the Umpqua Basin has been based upon the information provided from the fish counting station at Winchester Dam on the North Umpqua River. Between the years of 1947 and 1957, the North Umpqua boasted runs of sea-run cutthroat trout averaging approximately 900 fish per year. The highest number return of 1,800 fish occurred in 1954 and the lowest return within a ten year period was 450 fish in 1949. In the late 1950s, the sea-run cutthroat trout returns declined drastically.

The stocking of Alsea River cutthroat trout into the Umpqua River system began in 1961 and continued until the late 1970s. Introducing this genetically distinct trout stock into the Umpqua River system has apparently compounded the problem for the sea-run cutthroat trout native to the Umpqua River Basin. Sea-run cutthroat trout returns have been extremely low since discontinuing the hatchery releases in the late 1970s. The levels of returns resemble prehatchery release conditions of the late 1950s, with an average return of less than 100 fish per year (ODFW 1994 - overhead packet). Table 24 shows the number adult sea-run cutthroat trout that returned to the North Umpqua River from 1992 through 1999.

Table 24. Number of Returning Adult Sea-run Cutthroat Trout at Winchester Dam on the North Umpqua River from 1992 to 1999.

Year	Number of Fish
1992-1993	0
1993-1994	29
1994-1995	1
1995-1996	79
1996-1997	75
1997-1998	91
1998-1999	159
1999-2000 (as of June 15, 1999)	4

According to the available data, the South Umpqua River appears to have supported a larger run of sea-run cutthroat trout than the North Umpqua River. In 1972, 10,000 sea-run cutthroat trout were estimated to have returned to the South Umpqua River. Sea-run cutthroat trout populations have the highest occurrence in streams occupied by and accessible to coho salmon (Lauman et al. 1972). Sea-run cutthroat trout are currently limited to the upper South Umpqua River and Cow Creek, one of the major tributaries to the South Umpqua River. Warm water temperatures, lack of over-summering pool habitats, and low

flows prevent sea-run cutthroat trout from using stream reaches in the lower part of the basin (Nehlsen 1994).

2. Current Fish Status

The Umpqua River cutthroat trout (Oncorhynchus clarki) was listed by the National Marine Fisheries Service (NMFS) as an endangered species under the Endangered Species Act (ESA) of 1973, as amended. The Oregon Coast coho salmon (Oncorhynchus kisutch) was listed as a threatened species by NMFS (Federal Register, Vol. 63, No. 153/August 10, 1998/Rules and Regulations). The West Coast steelhead (Oncorhynchus mykiss) was proposed to be listed as a threatened species. However, NMFS designated the West Coast steelhead as a candidate species (Federal Register, Vol. 63, No. 53/March 19, 1998/Rules and Regulations).

The Pacific lamprey (Lampetra tridentata) and the Umpqua chub (Oregonichthys kalawatseti) are on the United States Fish and Wildlife Service (USFWS) list as Species of Concern and are considered to be Bureau Sensitive species by the BLM (Manual 6840). All of these species have been documented to occur in the South Umpqua River.

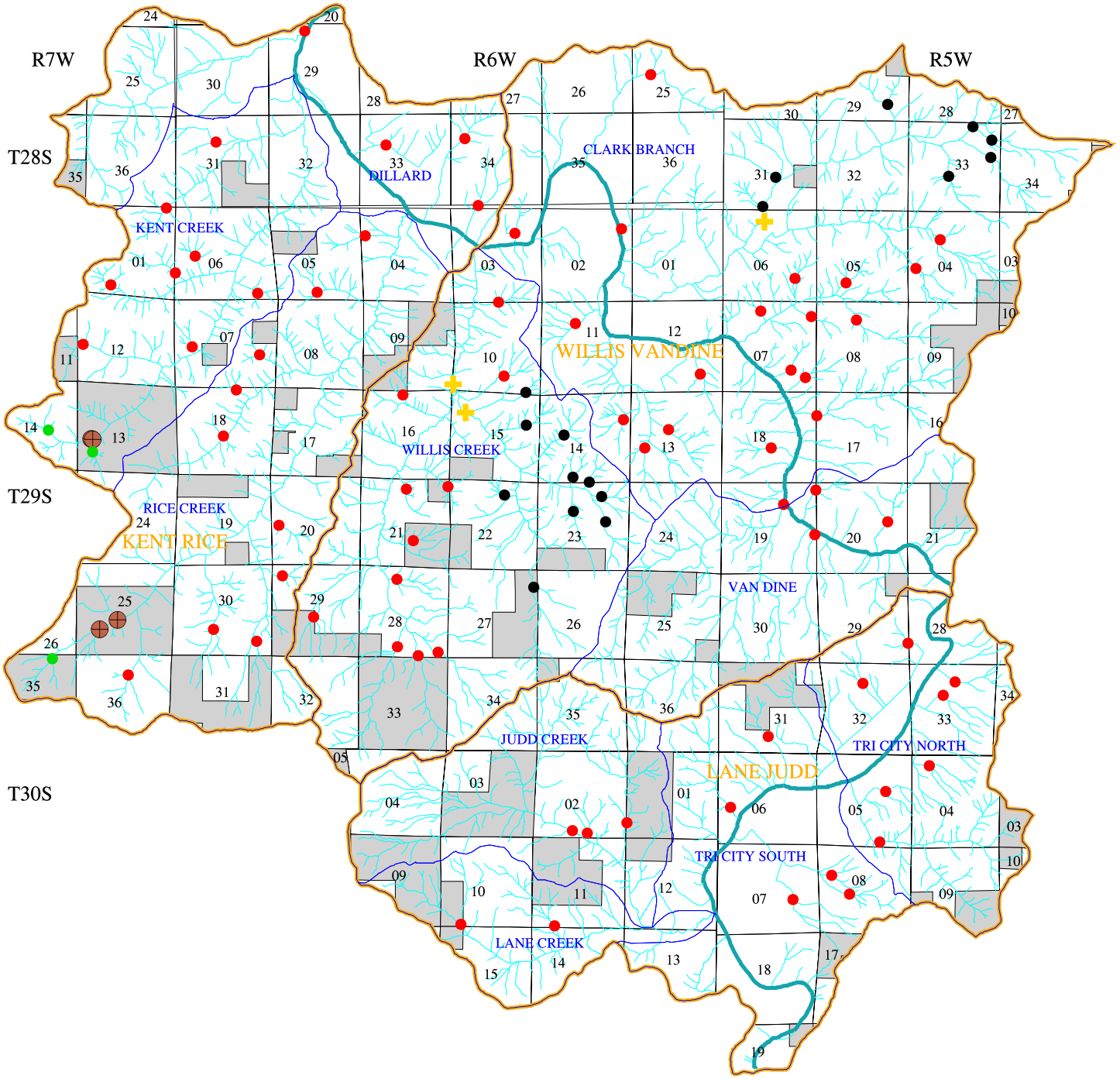
3. Current Stream Habitat Conditions

Fish distribution limits have been mapped using GIS for streams with documented barriers within the Middle South Umpqua WAU (see Map 17). Distribution limits of anadromous and resident fish are determined by the extent these fish are able to migrate upstream. Fish distribution is the estimated distance to known barriers or suspected upstream limits (see Table 25). Natural waterfalls, log or debris jams, beaver dams, and road crossings are potential barriers to fish movement and migration. Fish barriers are shown on Map 17, also.

Aquatic habitat inventories have been completed for the mainstems of eight streams in the WAU (see Map 18 and Table C-3 in Appendix C). The inventoried streams cover about 31 miles of the approximately 581 total stream miles within the WAU. The inventories are used to describe the current condition of the aquatic habitat with a focus on the fish-bearing stream reaches within a watershed.

The aquatic habitat inventory is not a fish distribution or fish abundance survey. The habitat inventory is designed only to survey physical habitat features. However, fish use and distribution information was noted in the habitat inventories. The stream surveyors noted fish use by visual observation only. Fish distribution surveys are currently underway on the Roseburg BLM District to determine the upper limits of resident fish use on BLM-administered lands. The information available on the habitat condition and the distribution of fish species in the streams that have not been surveyed is in the form of personal communications and observations by ODFW and BLM biologists.

Map 17. Middle South Umpqua Watershed Analysis Unit
Fish Distribution Limits



0 1 2 3 4 5 Miles

1:103397

- Drainages
- Subwatershed

Suspected Fish Distibution Limits

- Anadromous Fish Limits
- Historic Fish Limits
- Resident Fish Limits

Barriers

- Culvert
- Dam
- South Umpqua River
- Streams
- BLM Administered Land
- Section Lines

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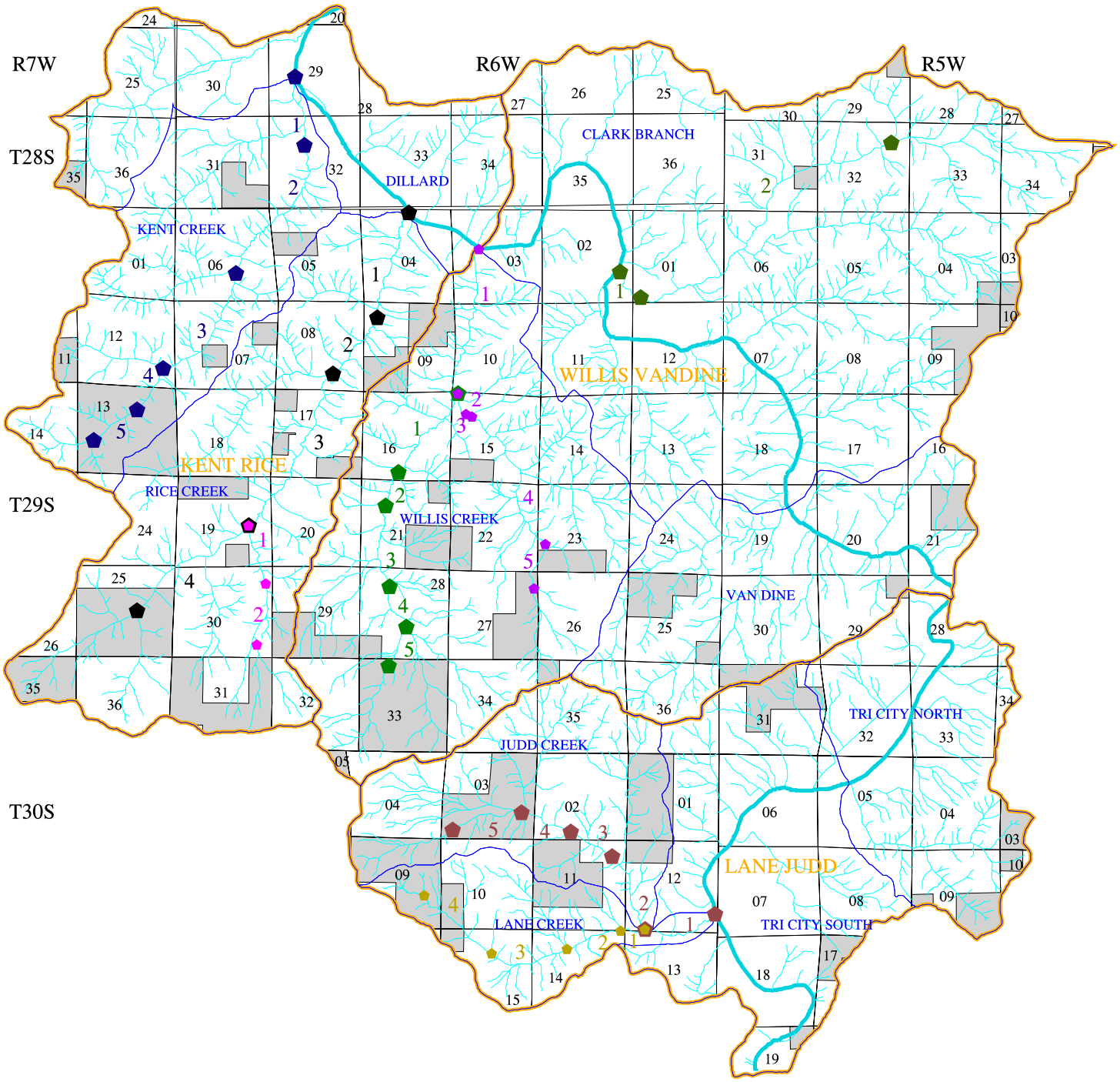
Table 25. Middle South Umpqua WAU Fish Distribution and Stream Summary.

Drainage Name **Subwatershed Name**	Total Stream Miles in the WAU	Total Stream Miles on BLM	Total Miles of Anadromous Streams	Miles of Anadromous Streams on BLM
Dillard	31.43	0.55	5.4	0.0
Kent Creek	50.54	6.97	9.9	1.4
Rice Creek	73.96	12.81	13.1	0.9
Kent Rice Subwatershed	155.93	20.33	28.4	2.3
Judd Creek	42.02	14.59	2.2	0.0
Lane Creek	20.05	4.61	3.3	0.0
Tri City North	39.22	2.60	7.4	0.0
Tri City South	36.42	3.40	9.3	0.0
Lane Judd Subwatershed	137.71	25.20	22.2	0.0
Clark Branch	141.50	2.00	22.2	0.0
Van Dine	49.20	4.44	0.0	0.0
Willis Creek	96.20	16.38	10.1	0.7
Willis Vandine Subwatershed	286.90	22.82	32.3	0.7
Middle South Umpqua WAU	580.54	68.35	82.9	3.0

Anadromous and resident fish distribution limits were determined based on documented barriers. Upper fish distribution limits were based on stream size and gradient using GIS data. An eight foot dam limits anadromous fish access on approximately five miles of Clark Branch. A ten foot dam blocks anadromous fish access to approximately 6.5 miles on the East Fork of Willis Creek. The data collected through the ODFW Aquatic Habitat Inventory can be used to analyze the components that may limit the aquatic habitat and the fishery resource from reaching their optimal functioning condition. The Habitat Benchmark Rating System is a method developed by the Umpqua Basin Biological Assessment Team (BAT team) to rank aquatic habitat conditions. The BAT team consists of fisheries biologists from the Southwest Regional Office of the ODFW, Coos Bay BLM District, Roseburg BLM District, Umpqua National Forest, and Pacific Power and Light Company. The matrix designed by the BAT team was to provide a framework to easily and meaningfully categorize habitat condition. This matrix is not intended to reflect equality of the habitat condition of each stream reach, but is intended to summarize the overall condition of the surveyed reaches. The matrix consists of four rating categories Excellent, Good, Fair, and Poor (see Table C-2 in Appendix C).

Map 18. Middle South Umpqua Watershed Analysis Unit
Stream Survey Reaches



0 1 2 3 4 5 Miles

1:102596

- Stream Survey Reach Breaks
- Drainages
- Subwatershed
- South Umpqua River
- Streams
- Section Lines
- BLM Administered Land

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Data from the 1994 and 1995 ODFW Aquatic Habitat Inventories for the Middle South Umpqua WAU were analyzed to determine an overall aquatic habitat rating (AHR) for each stream. How the ratings correlated with the NMFS Matrix are shown in Table 26.

Table 26. Aquatic Habitat Ratings (AHR) in Comparison to the NMFS Matrix.

ODFW Aquatic Habitat Inventories	NMFS Matrix
Excellent or Good	Properly Functioning
Fair	At Risk
Poor	Not Properly Functioning

Each stream contains different limiting factors. Limiting factors for the fishery resource may include reduced instream habitat structure, increased sedimentation, the absence of a functional riparian area, decreased water quantity or quality, or the improper placement of drainage and erosion control devices associated with the forest road network.

One of the 32 stream reaches identified in the aquatic habitat inventories was rated as being in good condition (see Table C-3 in Appendix C). Twenty-one stream reaches were rated as being in fair condition. Nine stream reaches were rated as being in poor condition. One stream reach was not rated due to the lack of information. No stream reaches were rated as being in excellent condition.

4. Interpretation

A rating system was developed to evaluate where management and restoration activities should take place. The following criteria were evaluated from the fisheries resource perspective.

Aquatic habitat condition - Areas were rated based on cutthroat trout and coho salmon habitat conditions. This rating relied heavily on professional judgement, current aquatic habitat data, and partly on personal observations by fish biologists.

Species diversity - Areas with a high degree of diversity (larger number of fish species) received the higher rating. Areas containing cutthroat trout, coho salmon, steelhead, and chinook salmon were rated the highest.

Access for anadromous fish - Areas containing natural blockages (i.e. waterfalls) would be rated low because anadromous fish would not have inhabited those areas.

Ownership pattern - This considers how much influence BLM actions would have on cumulative impacts. Whether the BLM administers enough land base to affect aquatic conditions in the area was also considered.

a. Current Riparian Reserve Conditions

(1) Roads

In the Pacific Northwest, the main concern associated with logging activities is increased erosion causing sediment to enter streams. Road construction and maintenance are the main sources of sediment entering streams. The literature indicates buffer strips less than 30 meters (98.4 feet) wide do not prevent sediment from entering the stream channels (Erman and Mahoney 1993, Packer 1967, and Trimble and Sartz 1957).

Approximately half of the roads in the Riparian Reserves are within 100 feet of a stream (see Table 19). The majority of these roads are considered main access routes and not likely to be fully decommissioned. However, these roads could be renovated or upgraded to minimize the impacts on water quality and the aquatic habitat.

Road and culvert inventories were conducted in 1999 to determine where roads and culverts are causing problems for the fisheries resource. The inventories focused on BLM-managed roads and BLM-administered lands. Some culverts in the Middle South Umpqua WAU were identified for be removed or replaced.

(2) Vegetation

The BLM administers approximately 13 percent (7,680 acres out of an approximate 59,396 acres) of the Middle South Umpqua WAU. Approximately 37 percent (2,819 acres out of a total 7,680 acres) of BLM-administered land is in Riparian Reserves. Desired future condition is to have greater than 75 percent of the Riparian Reserves in age classes greater than 80 years old. Currently, 38 percent of the Riparian Reserves are greater than 80 years old. Approximately 30 percent of the Riparian Reserves are less than 30 years old and 32 percent are between 30 and 80 years old (these numbers excluded non-forest acres in the Riparian Reserves).

(3) Large Woody Debris

Large woody debris (LWD) is an important component of the aquatic environment. Large woody debris interacts with stream geomorphic channel features to create a diversity of aquatic habitat types. The habitat created by LWD provides cover and refuge for fish. Large woody debris is also a substrate and food source for many aquatic macroinvertebrates and invertebrates, which fish eat. Large woody debris can dissipate energy associated with peak flow events and trap bedload substrates, especially in low gradient stream reaches. Trapped bedload substrates create spawning habitat for salmonids.

Past management practices, such as the stream cleaning in the 1970s, and road construction and salvage activities in riparian areas, left many streams throughout the Pacific Northwest lacking in LWD. The carrying capacity for LWD in streams is difficult to predict, since the removal of LWD adjacent to and in stream channels occurred decades ago. Based on studies conducted in wilderness areas, it is assumed that LWD was abundant in most Pacific Northwest streams. Recent ODFW aquatic habitat inventory data indicates well-distributed LWD is lacking in the surveyed stream reaches (see Table C-3 in Appendix C).

B. Wildlife

Many wildlife species live in the different plant communities present in the WAU. The various vegetation types provide habitat for more than 200 vertebrate species and thousands of invertebrate species. Fifty-six animal species are of special concern because they are Federally Threatened (FT), Endangered (FE), Bureau Sensitive (BS), Bureau Assessment (BA), or Oregon State sensitive species (see Table E-1 in Appendix E). In addition to these species, the Standards and Guidelines in the Record of Decision (ROD) for the Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA and USDI 1994b) lists animal species to Survey and Manage (S&M) for in Oregon, Washington, and California (USDA and USDI Appendix J2 1994a).

1. Threatened and Endangered Species

Five terrestrial animal species known to occur in the Roseburg BLM District are legally listed as Federally Threatened (FT) or Federally Endangered (FE). These include the American bald eagle (Haliaeetus leucocephalus) (FT), the marbled murrelet (Brachyramphus marmoratus) (FT), the northern spotted owl (Strix occidentalis caurina) (FT), the peregrine falcon (Falco peregrinus anatum) (FE), and the Columbian white-tailed deer (Odecoilus virginianus leucurus) (FE).

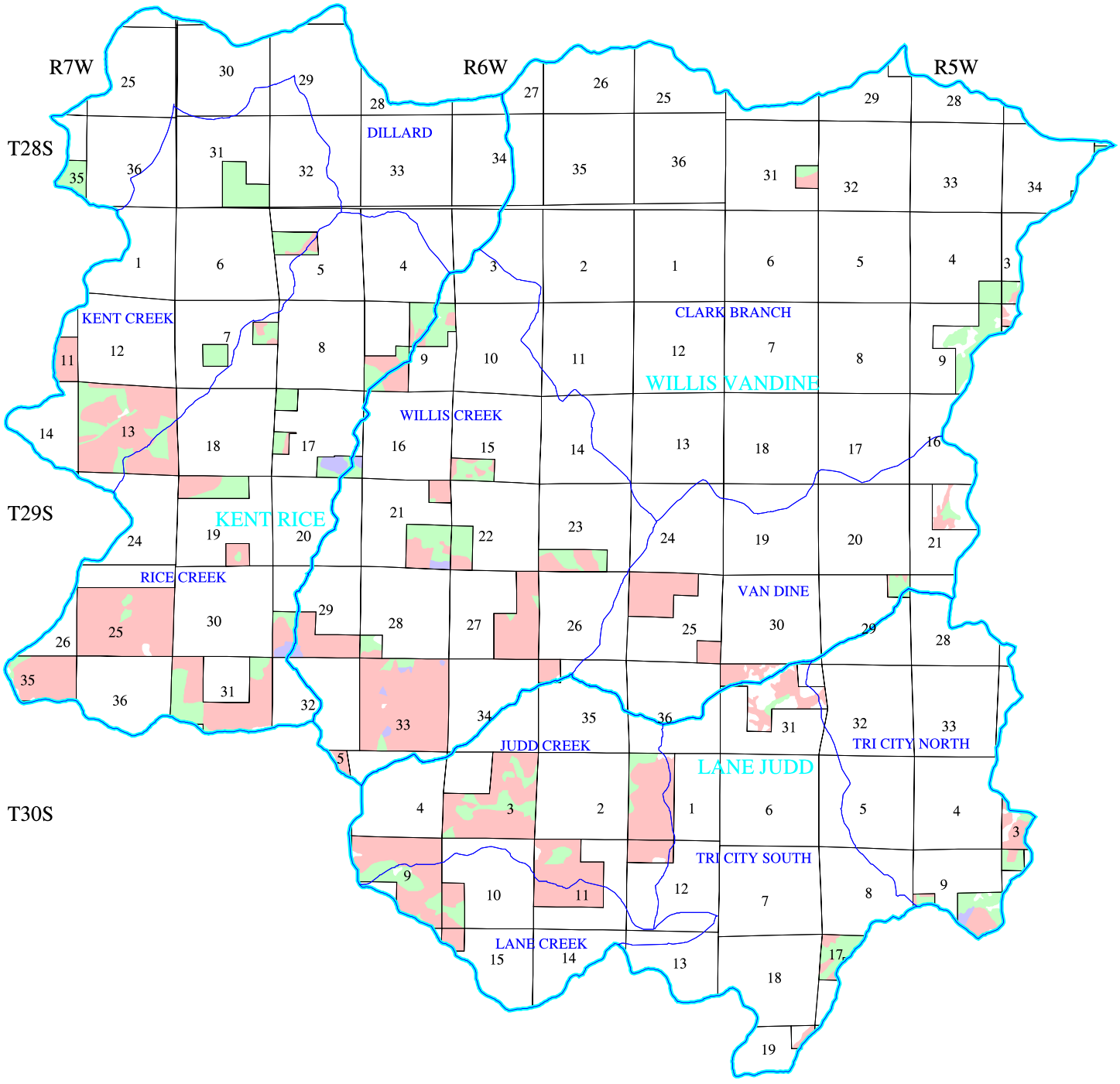
a. The Northern Spotted Owl

The northern spotted owl is found in the Pacific Northwest, from northern California to lower British Columbia in Canada. The geographic range of the northern spotted owl has not changed much from its historical boundaries. Nesting habitat historically used by northern spotted owls has been changed to the point owl population numbers have declined and distribution rearranged. These changes are considered to be a result of habitat alteration and removal by timber harvesting, fire, and land development (Thomas et al. 1990).

Suitable forest stands where spotted owls have been located are known as spotted owl activity centers or master sites. In the Middle South Umpqua WAU, there are two northern spotted owl master sites. This number includes current and historically active and inactive master sites. Both sites in the WAU are used by the same owl pair. The original master site location is on BLM-administered land while the alternate site is located on private land. Table 27 contains information about the status of use, habitat acres, occupation, and reproduction success of the northern spotted owls in the WAU.

Habitat on Federally-administered land important to the northern spotted owl was identified by Roseburg BLM District biologists based upon on-the-ground knowledge, inventory descriptions of forest stands, and known characteristics of the forest structure. Two habitat types were described and labeled Habitat 1 (HB1) and Habitat 2 (HB2). Habitat 1 describes forest stands that provide nesting, foraging, and resting components. Habitat 2 describes forest stands that provide foraging and resting components but lack nesting components. There are approximately 1,898 acres of suitable habitat in the WAU (see Map 19). About 25 percent of the BLM-administered lands and three percent of the WAU are considered to be suitable northern spotted owl habitat.

Map 19. Northern Spotted Owl Suitable and Dispersal Habitat Within the Middle South Umpqua Watershed Analysis Unit



0 1 2 3 4 5 Miles

1:103112

Drainages
Subwatershed
Ownership and Section Lines
Suitable Habitat
1
2
3

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Table 27. Spotted Owl Activity Center Ranking Data Within the Middle South Umpqua Watershed in the South River Resource Area (1996).

MSNO	Year Site was Located	Last Year of Known Active Pair (Pair Status + Number of Juveniles)	Last Year Occupied (Pair Status)	Number of Years of Reproduction/ Pair Status Since 1985	Suitable Habitat Acres in Provincial Radius (1.3 Miles)	Suitable Habitat Acres in 0.7 Mile Radius	Land Use Allocation	History Rank	Acres Rank	Occupancy Rank
2097	1989	1991(P+1J)	1991(P)	2	320	91	GFMA	1	D	1
2097A	1992	1998(P+1J)	1999(P)	7	378	273	State	1	D	1

Table 27 Definitions

Last Year of Known Active Pair - Gives the year, pair status, and young produced. NP = Site has not had a pair

Pair Status - M = Male; F = Female; J = Juvenile; P = Pair Status; (M+F) = Two Adult Birds, Pair Status Unknown; PU = Pair Status Undetermined; ND = Incomplete or No Data.

Number of Years of Reproduction/Pair Status Since 1985 - The first number represents the number of years with northern spotted owl reproduction at this site since 1985. The second number refers to the number of years for the entire history of the site since 1985 (including the original and alternate sites i.e. 1090A).

Occupancy Rank - 1: Sites with this ranking have current occupancy and have been occupied by a single northern spotted owl or pair of owls for the last three years; 2: Sites with this ranking have been occupied in the past, show sporadic occupancy by a single northern spotted owl or an owl pair, may be currently occupied; 3: Sites with this ranking have not been occupied during the last three years.

Acres Rank - These acres are in regards to suitable northern spotted owl habitat. A: These sites have more than 1,000 acres in the provincial radius and more than 500 acres within the 0.7 mile radius; B: These sites have more than 1,000 acres in the provincial radius but less than 500 acres in the 0.7 mile radius ; C: These sites have less than 1,000 acres in the provincial radius and more than 500 acres in the 0.7 mile radius; D: These sites have less than 1,000 acres in the provincial radius and less than 500 acres in the 0.7 mile radius.

History Ranking - This ranking includes occupancy ranking, reproduction data, acres ranking, habitat evaluation, and field experience about the site (location, quality, and forest structure). 1: A site considered stable due to consistent occupation by northern spotted owls and has been producing young consistently; 2: Site is consistently used by northern spotted owls but reproduction is sporadic; 3: Northern spotted owls have had some reproduction, occupation has been sporadic, or has not been occupied. Private = Site is located on private land. State = Site is located on Oregon State lands.

(1) Dispersal Habitat

Other areas not fitting into the HB1 or HB2 category and greater than 40 years old are considered to be dispersal habitat. Dispersal habitat refers to forest stands greater than 40 years old that provide cover, roosting, foraging, and dispersal components northern spotted owls use while moving from one area to another (Thomas et al. 1990, USDI 1992a; USDI 1994b). One method used to describe the dispersal habitat component on Federally-administered lands is the amount of 50-11-40 acres. This number (50-11-40) refers to the condition where 50 percent of forested stands are composed of 11 inch diameter trees with a minimum canopy closure of 40 percent (Thomas et al. 1990). This habitat condition is important as dispersal habitat outside the late-successional forest stands.

Late-Successional Reserves were established to protect and enhance conditions of late-successional and old-growth forest ecosystems. These ecosystems serve as habitat for marbled murrelets, northern spotted owls, and other animal species that use old-growth forests. Since there are no LSRs in the WAU, late seral stands may be limited, in the future, to Riparian Reserves or other withdrawn areas, such as northern spotted owl core or TPCC withdrawn areas.

About 38 percent of the Riparian Reserves in the WAU consist of late seral stands. The Riparian Reserves are separated by private lands, which lack late seral stands. Organisms dependent on late seral habitat for dispersal may be at risk in this WAU due to the limited amount of forested land (approximately 40 percent of the WAU is considered to be nonforested, mainly agricultural land), land ownership and pattern (approximately 13 percent of the WAU is BLM-administered land), and age class distribution in the WAU.

(2) Critical Habitat for the Recovery of the Northern Spotted Owl

There are no northern spotted owl critical habitat units within the WAU.

b. The American Bald Eagle

Historical distribution of the bald eagle included the entire northwestern United States (California, Oregon, Washington), Alaska, and western Canada. Bald eagle populations probably started declining in the nineteenth century but did not become noticeable until the 1940s (USDI 1986).

Throughout the North American range, drastic declines in bald eagle numbers and reproduction occurred between 1947 and the 1970s. In many places, the bald eagle disappeared from the known breeding range. The reason for this decline was the impact organochloride pesticide (DDT) use had on the quality of egg shells produced by bald eagles (USDI 1986). Bald eagle numbers probably declined on the Roseburg BLM District because DDT was used in western Oregon from 1945 to the 1970s (Henny 1991). Other causes of eagle decline included shooting and habitat deterioration (Anthony et al. 1983). Historically, removal of old growth forest stands near major water systems (e.g., South Umpqua River) contributed to habitat deterioration through the loss of bald eagle nesting, feeding, and roosting habitat.

Information collected from yearly inventories (1971 to 1995) by Isaacs and Anthony (1995) of known bald eagle sites in Douglas County do not list any sites, nests, or territories within or near the WAU. Midwinter bald eagle surveys from Days Creek to Melrose have not detected bald eagles in the WAU (Isaacs 1998). Bald eagle sightings along the South Umpqua River in the WAU are unusual. However, several bald eagle sightings have been documented along the South Umpqua River just north of the WAU. It is unknown if the bald eagles are nesting or if they are just using the area for foraging.

Some forest stands in the WAU within one mile of the South Umpqua River contain stand characteristics often used by nesting bald eagles and may be considered potential bald eagle habitat. Stand characteristics include large, dominant trees with large limbs and broken tops and near water. Bureau of Land Management administered lands in T29S, R5W, Sections 27 and 31 may contain potential bald eagle habitat. Surveys would occur if bald eagles are observed in the vicinity of potential habitat.

c. The Peregrine Falcon

Peregrine falcons were a "common breeding resident" along the Pacific coastline and present in many other areas, including southwestern Oregon (Haight 1991). Peregrine falcon populations in the Pacific Northwest declined because of organochloride pesticide use, shooting, other chemicals (avicides, such as organophosphate) used to kill other bird species considered to be pests, and habitat disturbance (loss of wetlands, loss of fresh water marsh environments in interior valleys, and increased rural development) (Aulman 1991).

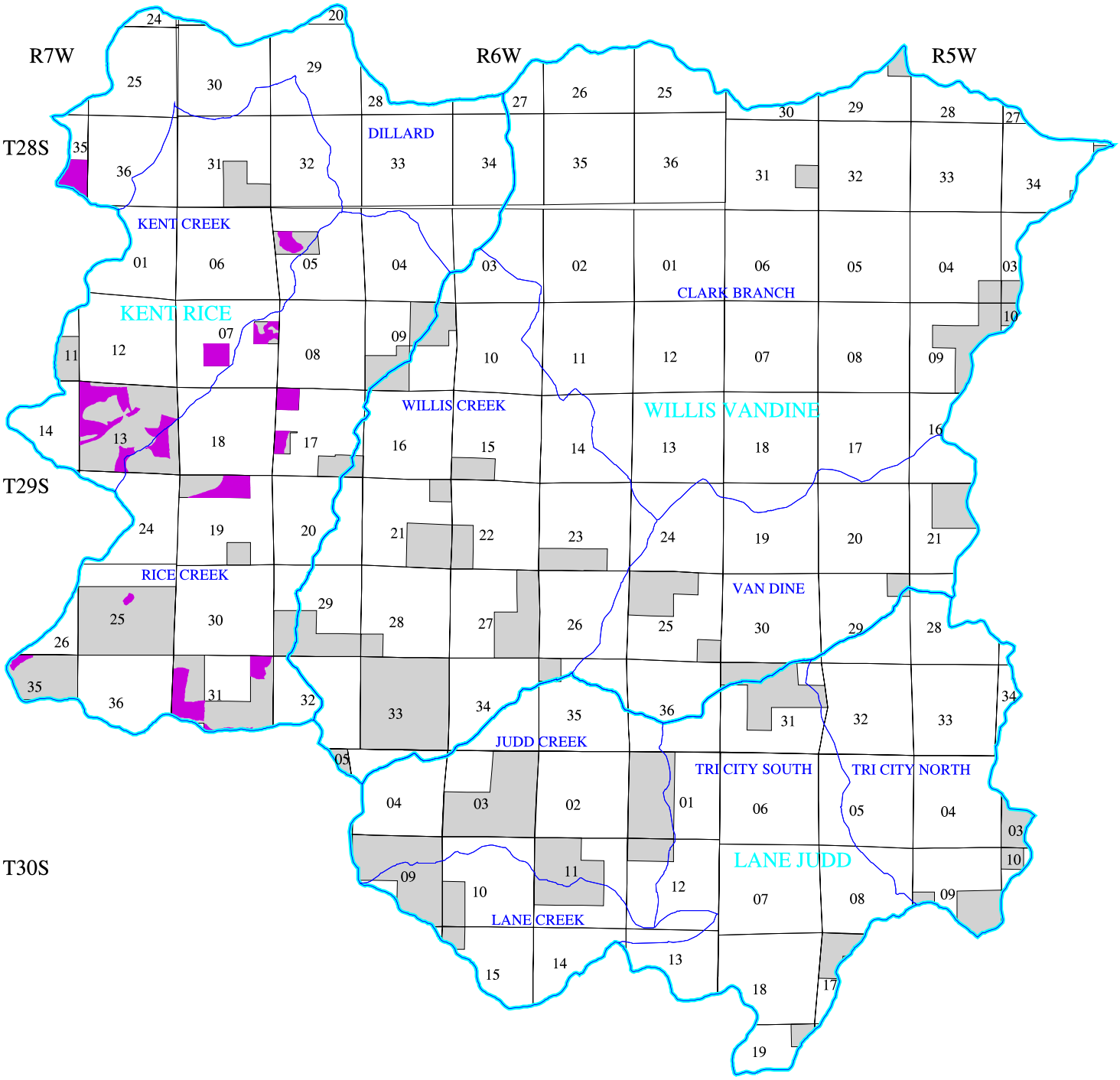
Several areas in the WAU have exposed bedrock due to erosion and other geological processes. However, there are no sites considered to be potential peregrine falcon habitat in the WAU. Peregrine falcons have been reported in the South River Resource Area. However, there is no record of an occupied site within the Middle South Umpqua WAU, as of July 1999.

d. The Marbled Murrelet

The marbled murrelet was listed as a threatened species in 1992 (USDI 1992c). Critical habitat for the recovery of the marbled murrelet was designated in 1996 (Federal Register 61(102):26256-26278). No designated marbled murrelet critical habitat occurs in the WAU.

The western portion of the WAU is inside the 50 mile marbled murrelet management zone from the coast, which is considered to be the extent of suitable marbled murrelet habitat. Information about the biology and inland nest sites indicates the marbled murrelet is unlikely to be found more than 50 miles from the Oregon Coast (USDA and USDI 1994a, and USDI 1992c). Surveys to locate marbled murrelets are not required beyond 50 miles from the Oregon Coast. Within the 50 mile zone, there are 585 acres of suitable marbled murrelet habitat in the WAU (see Map 20). Approximately half of the suitable marbled murrelet habitat is in some type of reserved Land Use Allocation. No marbled murrelet sites have been located in the WAU.

Map 20. Middle South Umpqua Watershed Analysis Unit
Marbled Murrelet Habitat



0 1 2 3 4 5 Miles

1:102132

Drainages
Subwatershed
Section Lines
Marbled Murrelet Habitat
BLM Administered Land

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Two years of protocol surveys are required prior to implementing projects that modify suitable marbled murrelet habitat. General marbled murrelet surveys have not been conducted in the WAU.

e. The Columbian White-tailed Deer

The Columbian white-tailed deer is not expected to occur in the WAU. Although, the Middle South Umpqua WAU is within the historical distribution range of the Columbian white-tailed deer it is outside the current distribution range (USDI 1983). The current known Columbian white-tailed deer population is restricted to an area northeast of Roseburg, approximately ten air miles from the northern boundary of the WAU (USDI 1983). However, over the past ten years, a small sub-population has been introduced into the Happy Valley area northeast of the WAU. The size of this population is unknown but is thought to be less than 30 animals. The Happy Valley sub-population is not considered to be a stable source for expanding of the range of the Columbian white-tailed deer at this time.

2. Remaining Species of Concern

Animal species not threatened or endangered may belong to the Bureau Sensitive, Bureau Assessment, or Survey and Manage categories. On the Roseburg BLM District, 23 are Bureau Sensitive and 14 are Bureau Assessment species. Table E-1 in Appendix E lists the species expected to occur in the Middle South Umpqua WAU.

Although there is information about the biology and habitat requirements of some of these species, population levels and current distributions are not available. Many of these animals use unique features, such as ponds, seeps, caves, or talus found throughout the landscape and associated vegetation cover. In the Middle South Umpqua WAU, the forest inventory age classes are available, but the distribution patterns and abundance of unique habitats are not available at this time.

a. Mollusks

In western Oregon and Washington, over 150 species of land snails and slugs have been identified. Mollusks can be found at most elevations and in different habitat types. Generally, snails and slugs avoid disturbed areas where habitat modification leads to loss of moisture and increased exposure to solar radiation. Current mollusk distribution reflects the progressive habitat fragmentation due to human alteration of forested environments. (Frest and Johannes 1993). Fragmentation has lead to genetic isolation and speciation.

Managing for late seral characteristics tends to increase the moisture retention in an area. Increased tree species diversity (especially hardwood species), down woody debris, and soil depth in late seral stands produce a more favorable moisture regime at a site and increases the abundance and diversity of mollusks present. Mollusk abundance increases the available nutrients at a site, increasing growth rates and moisture retention.

Over 200 species of aquatic mollusks have been documented in western North America. These species inhabit permanent or seasonal water bodies. Most freshwater mollusks prefer cold and clear streams with dissolved oxygen (DO) near saturation levels (Frest and Johannes 1993). In 1993, Frest and Johannes stated that 108 mollusk species (57 freshwater aquatic and 51 land) were known in the range of the northern spotted owl. Of these, 102 species are known or are likely to occur on Federally-administered lands.

In 1997, Frest and Johannes reported 46 mollusk species (17 land, 29 aquatic) were known to occur in Douglas County. An additional 75 species may be present. Thirty-one of these species were analyzed in the SEIS ROD as sensitive taxons. Only five species of land snails and slugs present in Douglas County are listed in Table C-3 of the SEIS ROD as requiring surveys prior to ground disturbing activities. One of these species is not expected to occur west of Interstate 5. Three of the species occur in the WAU.

Several common snail species have been located in the WAU including Ancotrema sportella, Haplotrema vancouverense, several species of Vespericola and Monadenia. Common slug species Ariolimax columbianus and Prophysaon andersoni were also located in the WAU. These mollusks use a wide variety of habitat types. No Survey and Manage mollusk species have been found in the WAU.

One Survey and Manage species suspected to occur in the southern portion of the Roseburg BLM District is Helminthoglypta hertleini. This medium-sized land snail is frequently found in rocky talus habitats. The habitat type and range is similar to that of the Del Norte salamander, which is also a Survey and Manage species. No sites of Helminthoglypta hertleini had been found on the Roseburg BLM District, as of July 1997.

Three other Survey and Manage mollusk species are expected to occur in the WAU. Surveys would help determine the extent of mollusk ranges, species abundance, and species diversity. Surveys for Survey and Manage mollusk species are required before ground disturbing activities are implemented.

b. Amphibians

Amphibian inventories were conducted in the South River Resource Area in 1994 and 1997 (Bury 1995 and Bury 1997, final report pending). These inventories document amphibian species in the area. The spotted frog is not expected to occur in the WAU and was not found during the 1994 inventory. Species like the Southern Torrent salamander (Rhyacotriton variegatus), western red-backed salamander (Plethodon vehiculum), Dunn's salamander (Plethodon dunni), and other regional species were not located in the WAU.

Amphibian species like the northern red-legged frog, foothill yellow-legged frog, and clouded salamander use unique habitats within many different vegetation types. Features like large down woody material, talus slopes, creeks, seeps, ponds, and small wetlands are often used by amphibian species in southwestern

Oregon. Because these features are found in the Middle South Umpqua WAU, amphibian species are expected to occur in the WAU.

The Del Norte salamander (Plethodon elongates), a Survey and Manage species, was located near Council Creek in the Cow Creek Watershed in 1999. This is the farthest north known Del Norte salamander site located in the South River Resource Area and the Roseburg BLM District. The Del Norte salamander uses forested talus habitat, rocky substrates in hardwood forests, and riparian areas. Other habitat features include cool moist conditions with moss and fern ground cover, lichen downfall, deep litter, and cobble dominated rocky substrates (IB-OR-96-161 Protocols for Survey and Manage Amphibians).

The WAU falls within 25 miles of a known Del Norte salamander site. Projects in the WAU need to be surveyed prior to ground disturbing activities. Map 21 shows locations of potential Del Norte salamander suitable habitat in the WAU.

c. Mammals

(1) The White-footed Vole

Mammals like the white-footed vole and the red tree vole, which have geographic ranges including the Roseburg BLM District, are expected to be present in the WAU. Information about the biology and life history of the white-footed vole is limited (Marshall 1991). This species is associated with riparian zones, woody materials, and heavy cover. More recent information suggests the white-footed tree vole is associated with mature forests (Marshall 1991).

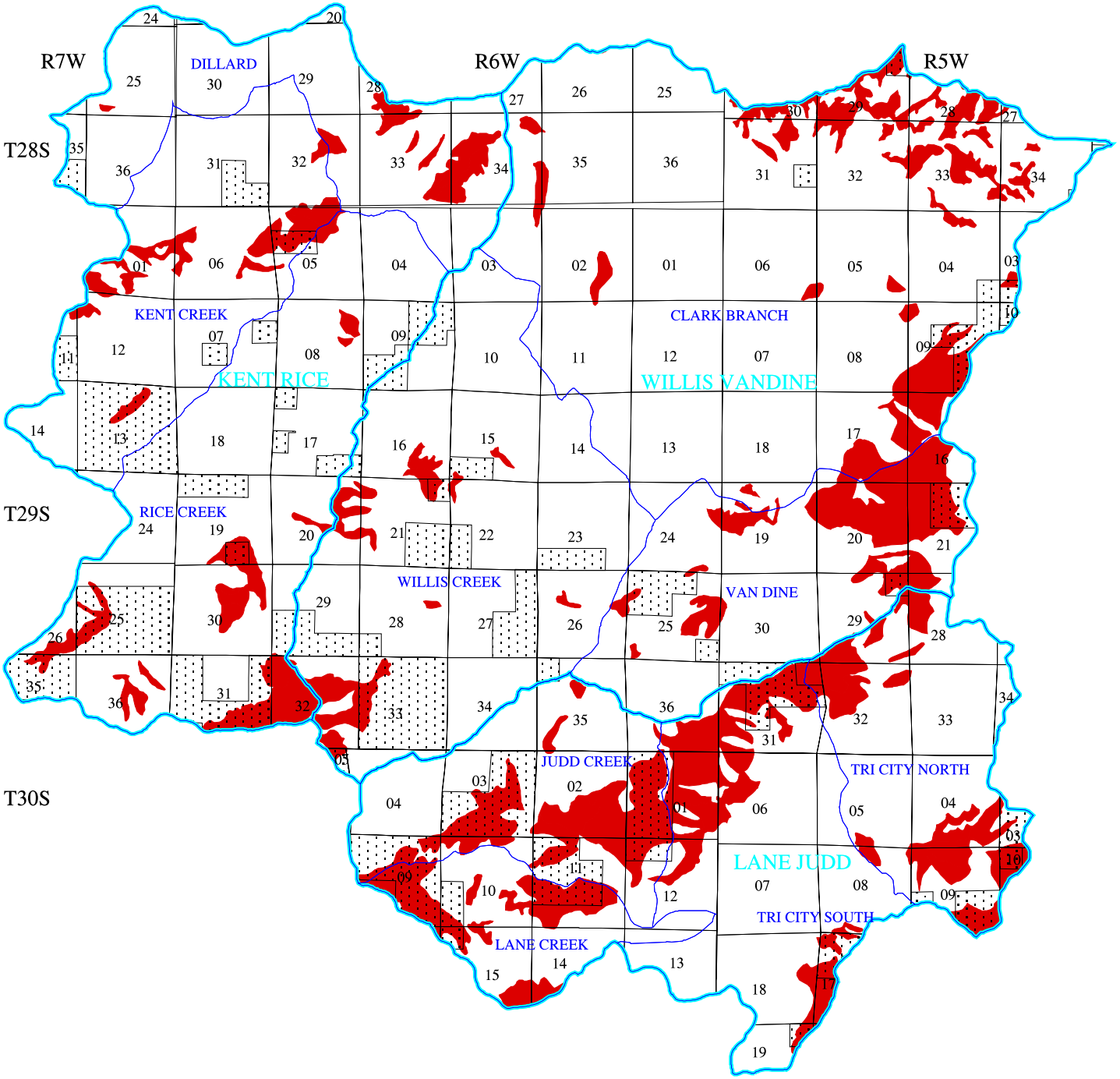
(2) The Red Tree Vole

The red tree vole is an arboreal rodent, which lives inside the canopy of Douglas-fir forests in Oregon and Northern California. Its primary food is Douglas-fir needles. However, Sitka spruce, western hemlock, and grand fir needles are also eaten by red tree voles (Huff et al. 1992). Reports from evaluating northern spotted owl pellets indicate the red tree vole is present in the WAU.

(3) Bats and Other Cavity Dwellers

During the summer of 1994, a survey to identify the bat species present in the South River Resource Area was conducted by Dr. Steve Cross of Southern Oregon College in Ashland, Oregon. Most bat species in the Pacific Northwest roost and hibernate in crevices in protected sites. Bat species use unique habitats like caves, talus, cliffs, snags, and tree bark for roosting, hibernating, and maternity sites. These components may be near or within vegetated areas such as young or old forest stands. Bats also use other unique habitats (ponds, creeks, and streams) to find food and water. Special status bat species present on the Roseburg BLM District are expected to occur in the WAU.

Map 21. Potential Del Norte Salamander Habitat in the Middle South Umpqua Watershed Analysis Unit



0 1 2 3 4 5 Miles

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Drainages
Subwatershed
Section Lines
BLM Administered Lands
Potential Del Norte Salamander Habitat

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d. Northern Goshawk

Information about the northern goshawk is readily available (Marshall 1991). However, most of the work with this species was conducted east of the Cascade Mountains. Current geographic distribution suggests the northern goshawk would not be expected to occur in most of the Roseburg BLM District. Observations recorded since 1984 show the northern goshawk is present north of the expected distribution range. In the early 1980s, two nest sites were found on the Roseburg BLM District but were not located within the Middle South Umpqua WAU. Goshawks have not been observed in the WAU.

e. Other Raptors

The WAU supports other bird of prey species common to the region but estimates of local populations are not available. Raptor species occur where suitable habitat is present.

f. Neotropical Species

Bird species that migrate and spend the winter south of the North American Continent are considered to be neotropical bird species. Bird species that live on the North American Continent year round are called resident birds. Widespread concern for neotropical bird species, related habitat alterations, impacts from pesticide use, and other threats began in the 1970s and 1980s (Peterjohn et al. 1995).

Oregon has over 169 bird species considered to be neotropical migrants. Population trends of neotropical migrants in Oregon show declines and increases. Over 25 species have been documented to be declining in numbers (Sharp 1990). Oregon populations of 19 bird species show statistically significant declining trends while nine species show significant increasing trends (Sharp 1990). Including all species that show declines, increases, or almost statistically significant trends, there are 33 species decreasing and 12 species increasing in numbers in Oregon (Sharp 1990).

From 1993 through 1999, neotropical birds were captured and banded and habitat evaluations were conducted in the South River Resource Area. However, this work was not conducted within the WAU.

The WAU supports populations of neotropical bird species. Given the different vegetation zones, the WAU may provide habitat for more neotropical bird species than those species located at the banding station. The unique and diverse habitats found in the interior valleys have hardwoods, shrubs, and conifers that function as breeding, feeding, and resting habitat for many neotropical birds.

g. Herons

A great blue heron rookery (clusters of nest sites in one or a few trees) is located along the South Umpqua River between Willis and Van Dine Creeks. The rookery is located on private land and has been impacted

recently by the development of a gravel quarry in the South Umpqua River. It is unknown if the herons would relocate in the vicinity.

h. Big Game Species (Elk and Deer)

Historically, the range of Roosevelt Elk extended from the summit of the Cascade Mountains to the Oregon coast. In 1938, the elk population in Oregon was estimated to consist of 7,000 animals (Graf 1943). Elk numbers and distribution changed as people settled in the region. Over time, elk habitat areas shifted from the historical distribution to "concentrated population centers, which occur as islands across forested lands of varying seral stages" (South Umpqua Planning Unit 1979). Information about the historical distribution of elk within the WAU and the equivalent management unit designated by ODFW is not available. Elk numbers may have decreased, as reported in other parts of the region, due to the increased number of people and the amount of road construction, home construction, and timber harvesting that has occurred in the area (Brown 1985).

The black-tailed deer range is throughout Oregon. The timber harvesting that occurred after WWII created young seral age stands (less than 20 years old) allowing black-tailed deer populations to increase to the point that liberal hunting seasons were established. Black-tailed deer numbers remained stable through the late 1970s in the South Umpqua Planning Unit (South Umpqua Planning Unit 1979). Early seral stands created after timber harvesting benefit deer and elk.

The number of Roosevelt Elk and black-tailed deer in the WAU are not available (Personal communication from ODFW). One or two elk herds use remote areas in the WAU. Elk and deer forage for food in open areas where the vegetation includes grass-forb, shrub, and open sapling communities. Both species use a range of vegetation age classes for hiding. This hiding component is provided by large shrub, open sapling, closed sapling, and mature or old-growth forest components (Brown 1985).

Most of the WAU is located within the Melrose unit, designated by ODFW. The Melrose unit is being managed to reduce elk numbers and the amount of damage caused on private lands. Coordinating activities with ODFW could meet objectives to reduce the damage caused by elk on private lands.

Minimum quality indices for cover, forage, and road density for elk were presented in the Proposed Roseburg District Resource Management Plan/EIS (USDI 1994b). In the WAU, all three indices are below the minimum levels.

3. Interpretation

a. General Habitat Condition

The arrangement of the various vegetation age classes within the WAU is a result of natural and human caused events. Natural disturbance like fire, winds, and floods changed the landscape by altering plant

community distribution and ages. The WAU has been impacted by human use due to the proximity of major transportation routes and urban areas. Human impacts include fire used to clear land of undesired vegetation, timber harvesting, road construction, home building, and dividing land by straight line boundaries.

The lower elevations have been developed for residential and agricultural uses, which affects wildlife use of these areas. Nonforested areas, such as agricultural and urban areas, have not increased significantly in the past sixty years. However, the density of people within the populated areas has increased and new homes have been built in previously undeveloped areas. Acres in the mid seral age class have increased but early seral stands have replaced many of the hardwood and older mixed conifer stands. Consequently, wildlife species would have experienced some change in habitat availability.

The amount of late seral stands has decreased since 1936. Late seral stands comprise about 13 percent of the WAU, using satellite imagery (see Map 7). Late seral stands on serpentine soils may not be larger than 20 inches in diameter at breast height (DBH) and would not function the same as similar aged stands with old-growth structure. The late seral stands remaining in the WAU have become fragmented. The Rice Creek, Judd Creek, and Willis Creek Drainages have been affected the most. Most of the late seral stands are located in the higher elevations in the western portion of the WAU and separated from each other. Many of the late seral stands are on BLM-administered lands. About 57 percent of the late seral stands on BLM-administered lands are reserved or withdrawn from timber harvesting.

Stands harvested in the 1950s providing mid seral habitat generally contain residual late seral components, such as large logs and cull trees. The residual components contribute functionality of the current stands for many wildlife species. Generally, residual components have not been left in stands harvested after the 1950s causing stands to take longer to begin functioning as late seral habitat.

The amount of late seral habitat has decreased with fragmentation of the remaining habitat. The poor quality of late seral habitat growing on the serpentine soil areas in the WAU and fragmentation makes the habitat less suitable for late seral dependent species. Treating young, even aged stands could create late seral habitat. Management on private lands would continue to be a major factor determining the type and arrangement of wildlife habitats and opportunities in the WAU. Partnerships with landowners in the upland areas could be pursued to reduce fragmentation of the remaining late seral habitat.

b. Northern Spotted Owl

Based on management direction in the Northwest Forest Plan and the Roseburg BLM District RMP, activity centers on Matrix lands located before January 1 1994, must be protected by maintaining the best 100 acres of suitable habitat near known owl sites (USDA and USDI 1994b and USDI 1995). The northern spotted owl site in the WAU is protected by a residual habitat area (core area) of 76 acres. This represents the total amount of suitable habitat on BLM-administered land within 1/4 mile of the site center. Table 27 shows the northern spotted owl territory within the WAU has less than 40 percent (1,336 acres)

of suitable habitat within 1.3 miles of the site. The northern spotted owl pair, associated with this site, has been nesting at an alternate site for the past seven years. The alternate site, located on state land to the west, does not have any officially protected habitat around it.

The spotted owl is an example of a species that requires habitat connectivity, dispersal areas, and nesting areas. To assist in the decision making process, the habitat surrounding the master site in the WAU was evaluated using the provincial radius (1.3 Miles) and the 0.7 mile radius.

Dispersal Habitat

Developing dispersal habitat and scheduling timber harvesting to maintain or create effective dispersal pathways are methods for meeting northern spotted owl management objectives. A major factor contributing to the declining northern spotted owl population is the replacement rate of owls (specifically female) at known sites by new birds, known as "floaters" (Burnham et al. 1994). Floaters are typically juvenile, unpaired adult, and subadult birds who move through and around established pair sites using the fragmented habitat outside of defended territories. Minimizing risks for dispersing birds in the short term may help maintain viable, reproducing pair sites, stabilizing the northern spotted owl's rate of decline.

Riparian Reserves were designated to help provide dispersal opportunities for late seral species. Riparian Reserves within the WAU are composed of 38 percent late seral habitat, which can be considered suitable foraging habitat. Approximately 45 percent of the Riparian Reserves are considered to be functioning as dispersal habitat. Considering the BLM administers approximately 13 percent of the WAU, the functional dispersal habitat in Riparian Reserves represents less than 6 percent of the WAU. The Riparian Reserves, by themselves, do not provide habitat allowing northern spotted owls to disperse throughout the WAU. Northern spotted owls would need to use the adjacent watersheds to the south or west for dispersing.

All of the Connectivity/Diversity Blocks in the WAU contain more than 30 percent in late seral stands. Some sections within the WAU were been grouped together to be considered a Connectivity/Diversity Blocks. The management direction for maintaining at least 25 to 30 percent in late seral stands would be applied to the Connectivity/Diversity Block. The Connectivity/Diversity Blocks would provide resting, foraging, and cover for dispersing northern spotted owls.

C. Plants

1. Special Status Plants

Surveys have been conducted for Special Status Plants on portions of the Middle South Umpqua WAU. However, many Survey and Manage and Protection Buffer species do not have survey protocols developed. Appendix J2 of the Final Supplemental Environmental Impact Statement (FSEIS) was the source for information on fungi, lichens, and bryophytes and their habitats. At the watershed analysis level, identifying locations of species suspected to occur in the WAU would be based on habitat. Five Special Status Plant species have been documented to occur in the WAU.

Allium bolanderi (Bolander's onion), Bureau Assessment Species
Allium bolanderi grows on stony slopes and gravelly flats on serpentine soils below 3,000 feet in elevation. Distribution ranges from Douglas County, Oregon to Lake County, California.

Calochortus coxii (Crinite Mariposa Lily), Bureau Sensitive Species
Calochortus coxii is a newly discovered and described species known only to exist along a twelve mile serpentine ridge system between Dodson Butte and Riddle in Douglas County, Oregon. Calochortus coxii is a distinct, showy, perennial forb in the lily family that blooms from late June to July. Calochortus coxii is restricted to serpentine soils. It is found in a number of different habitats ranging from woodlands to open grasslands. Currently only two real populations exist, separated by Interstate 5 (Fredricks 1989).

A Conservation Strategy has been developed to identify and schedule management actions to remove or limit threats and provide for the long term survival of Calochortus coxii. An Environmental Assessment of Calochortus coxii habitat restoration was completed in 1999. Proposed treatments included prescribed burning, tree girdling, and thinning precommercial sized trees to be applied on scattered small areas. The treatments would occur over a ten year period. The conservation strategy would be reevaluated after ten years. Monitoring would attempt to determine plant response and treatment success.

Pellaea andromedaefolia (Coffee Fern), Bureau Assessment Species
Pellaea andromedaefolia is a fern growing on dry rock outcrops, mostly in the sun, but at times along shaded stream banks below 4,000 feet in elevation. Distribution ranges from Lane County, Oregon south to Baja, California.

Phacelia verna (Spring Phacelia), Bureau Tracking Species
Phacelia verna is a annual forb in the waterleaf family that blooms from April to June. Its distribution range is southwest Oregon. It grows on mossy sparsely vegetated rock outcrops and balds between 500 and 6,600 feet in elevation.

Polystichum californicum (California shield fern), Bureau Assessment Species
Polystichum californicum grows on rock outcrops beneath forest canopies or on slopes at low and mid elevations. Distribution ranges from British Columbia south to Santa Cruz County, California.

Five other Special Status Plants that have been documented in the South River Resource Area are suspected to occur in the Middle South Umpqua WAU.

Aster vialis (Wayside aster), Bureau Sensitive and Survey and Manage Species
Aster vialis is a rare locally endemic plant known only from Lane, Linn, and Douglas Counties, in Oregon. It occurs primarily along ridges between Eugene and Roseburg. Plant succession resulting in canopy closure of the forest over these plants could be a significant management concern. Long term survival of this species may depend on controlled disturbance of the habitat to allow more light to penetrate the canopy and improve conditions for Aster vialis reproduction. The role of fire is probably important to maintaining viability. Aster vialis thrives in openings within old-growth stands or associated with edge habitat (Alverson and Kuykendall 1989).

Astragalus umbraticus (Woodland Milk Vetch), Bureau Assessment Species
Woodland milk vetch grows in open woods at low to mid elevations from southwest Oregon to northwest California. Woodland milk vetch has been observed to grow in areas impacted by fire and logging. It is likely this species has become rarer because of fire suppression activities.

Bensoniella oregona (Bensoniella), Federal Candidate Species
This species occurs along intermittent streams or meadow edges in mixed evergreen and white fir communities from 3,000 to 5,000 feet in elevation. It occurs less frequently in riparian shrub and forest openings, usually occupying upper slopes and ridgetop saddles with north aspects. It tolerates some disturbance if subsurface drainage is not altered. Populations along clearcut streams are very small. Bensoniella occurs in very specific meadow and stream edge habitats on soils derived from ancient sedimentary rocks (Copeland 1980 in Lang 1988).

Cypripedium montanum (Mountain Lady's Slipper), Tracking and Survey and Manage Species
Cypripedium montanum populations are small and scattered. Less than 20 exist west of the Cascade Mountains. Small populations may reflect the slow establishment and growth rate of this species. Cypripedium montanum persists in areas that have been burned. The species ranges from southern Alaska and British Columbia to Montana, Idaho, Wyoming, Oregon, and California. Survival of the species may depend on protecting known populations and developing a conservation plan (USDA and USDI 1994a).

Lupinus sulphureus var. kincaidii (Kincaids Lupine), Bureau Sensitive Species
This is one of the three varieties of Lupinus sulphureus found in Oregon. It grows in the Willamette Valley and south into Douglas County, with a disjunct population reported in Lewis County, Washington (Eastman 1990). Lupinus sulphureus has been observed growing in road cuts and jeep trails. Long term survival of this species may depend on controlled disturbance of the habitat to allow more light to penetrate the canopy and improve conditions for lupine reproduction (Kaye et al. 1991).

Other plants to consider include Protection Buffer species that are suspected to occur in the WAU. Protection Buffer species suspected to occur in the WAU include the Bryophytes Buxbaumia viridis,

Rhizomnium nudum, Schistostega pennate, and Tetraphis geniculate and the Fungus Sarcosoma mexicana. Survey and Manage plant species suspected to occur in the Middle South Umpqua WAU are listed in Table F-1 in Appendix F.

2. Noxious Weeds

Noxious weed encroachment has reduced natural resource values in the Middle South Umpqua WAU. Noxious weed invasions can affect native plant communities by reducing the abundance and distribution of native plants (Bedunah 1992).

The weed management program is designed to maintain and restore desirable plant communities and healthy ecosystems. The Bureau of Land Management has an agreement with the Oregon Department of Agriculture (ODA) where noxious weed locations are identified and monitored by the BLM and control measures are administered by the ODA.

Biological controls have been approved and are used to slow or reduce the spread of established populations of widespread weeds, such as thistles, Saint John's wort and Scotch broom. Mechanical and chemical treatments have been used to prevent the spread of Scotch broom and decrease visibility hazards on forest roads.

Yellow Starthistle (Centaurea solstitialis) and Rush Skeletonweed (Chondrilla juncea) have been documented as occurring in the WAU. Both of these species have been designated as Target noxious weeds by the Oregon Department of Agriculture because of the economic threat. Yellow Starthistle and Rush Skeletonweed are growing along and west of Interstate 5 in the WAU. There is a high potential Yellow Starthistle would spread throughout the WAU, since a single Yellow Starthistle plant can produce up to 150,000 seeds under optimum conditions.

The BLM uses an integrated weed management approach. This approach includes using mechanical, chemical, and biological methods to reduce noxious weed populations. Goals important in implementing integrated weed management include inventorying species, identifying potential invaders, monitoring, prioritizing noxious weed species, managing and restoring habitat, revegetating bare soil, developing rock source management plans, and keeping records of rock surfaced roads that may have noxious weed seed.

The intent of the integrated weed management program is to maintain and restore desirable plant communities and healthy ecosystems. Preventing the spread and establishment of new noxious weed populations is the best protection method. The management strategy concerning new noxious weed invasions would be to eradicate the species to keep it from spreading to the point where eradication is not possible. Treatments in following years may be needed to eradicate invading noxious weeds. Established invasions may not allow practical or economical eradication treatments. Treatments to contain existing large populations and eradicate small outlying populations would be used on established invasions.

VIII. Synthesis

The Bureau of Land Management administers approximately 13 percent of the Middle South Umpqua WAU. Since about 87 percent of the WAU is privately owned, conditions in the WAU are affected the most by land management activities on private lands. Bureau of Land Management activities would have a small effect at the watershed scale. Timber harvesting activities on BLM-administered lands through the year 2024 are estimated to affect about two percent of the WAU.

About 40 percent of the WAU is nonforested (mostly agricultural land). The WAU has about the same amount of agricultural land as in 1936. The amount of nonforested land affects the vegetation patterns in the WAU. The nonforested land may also be a barrier to the movement of some wildlife species and affect the distribution of those species.

Since about 40 percent of the WAU is considered to be nonforested, it would be expected the WAU would have less than the 49 to 68 percent in late seral stands estimated to have occurred in the Oregon Coast Range from the late 1850s to the early 1900s. In 1936, about 24 percent of the WAU consisted of late seral stands. Assuming all private lands were less than 80 years old, the WAU would be estimated to consist of four to six percent in late seral stands in the future.

Approximately 6,295 acres of serpentine soils occur in the WAU. Douglas-fir productivity is poor on serpentine soils. However, grasses grow rapidly. Late seral stands on serpentine soils do not resemble the typical late-successional stand with large trees and multiple canopy layers. Although, most of the serpentine soils on BLM-administered lands in the WAU are withdrawn from timber harvesting, the poor productivity for Douglas-fir on these soils limits the value for wildlife that use late seral stands.

Land management practices, roads, and timber harvesting can affect stream channels and the hydrology of the WAU. When precipitation is routed to stream channels faster, it may cause increased peak flows and less water to be stored as groundwater.

Reducing road densities, replacing culverts, improving roads, constructing stream restoration projects, and thinning in Riparian Reserves would address water quality and stream channel conditions in the WAU. Stream temperatures, dissolved oxygen, sediment, fish passage, and peak flows are water quality and fisheries conditions that could be improved by reducing road densities, replacing culverts, improving roads, and constructing stream restoration projects. Thinning in Riparian Reserves would allow trees adjacent to stream channels to grow and provide natural recruitment of LWD faster than without management.

Timing and spacing of timber harvesting activities could help minimize impacts on wildlife, peak flows, and streams. Timber harvesting may be used to help with the cost of conducting watershed restoration opportunities.

IX. Recommendations

A. Port-Orford Cedar

Site specific projects in the WAU should consider the impact on Port-Orford cedar. Proposed project areas should be surveyed for the presence of Port-Orford cedar. Consider treatments to prevent the introduction of Port-Orford cedar root disease into the WAU. Management activities within the range of Port-Orford cedar should follow the BLM Port-Orford cedar Management Guidelines to mitigate damage caused by Phytophthora lateralis.

B. Fire and Fuels Management

Broadcast and pile burning should continue to be used for site preparation, to reduce vegetative competition, and to a lesser extent to reduce hazardous fuels accumulations. Site preparation may include broadcast burning regeneration harvest units, burning hand or machine piled logging slash, and burning landing decks. Burning activity fuels may also reduce wildfire hazards. When other resource concerns eliminate using prescribed fire, mechanical or manual fuels treatments may be necessary to achieve fuels management objectives. Fuels treatments can rarely be justified as the primary reason for reducing the risk of wildfire. Consider reducing wildfire risks when forest management activities create high fire risk conditions. Site preparation prescriptions should be written to achieve the silviculture objectives and reduce the fuels hazards as a secondary objective.

Consider the timing and size of forest management activities to avoid increasing the risk of unplanned wildland fire. Consider leaving some areas untreated or manipulating fuels in precommercial thinning stands. Providing fuel breaks and creating a variety of fuel types, such as by not thinning some stands, could allow wildfires to be suppressed at a smaller size.

C. Soils

Best Management Practices (BMPs) should be applied during all ground and vegetation disturbing activities. See Appendix D, Roseburg District Record of Decision and Resource Management Plan (USDI 1995) for a list and explanation of BMPs. Along with the BMPs, the Standards and Guidelines in the SEIS Record of Decision (USDA and USDI 1994) should be implemented in order to achieve proper soil management. Best Management Practices should be monitored for implementation and effectiveness in order to document that soil goals are being achieved.

D. Hydrology

Aquatic habitat could be improved by using bioengineering techniques on stream restoration projects and avoiding the use of rip rap, gabion baskets, or check dams. Consider stabilizing bank erosion in main channels and decreasing peak flow in areas with unstable soils.

Consider monitoring stream restoration projects for temperature, turbidity and sediment, and channel morphology changes.

Consider conducting stream surveys to help in designing stream restoration projects, such as removing culverts when decommissioning roads or replacing culverts on fish-bearing streams.

Many sections in the WAU have roads causing water quality problems. Refer to the TMO file or contact the Area Hydrologist for a list of roads observed to be causing water quality problems. Some roads to consider fully decommissioning or improving are listed in Appendix G Roads could be fully decommissioned without limiting future management activities in the WAU. Roads within Riparian Reserves, that have been identified as causing water quality problems, and in drainages with the highest road densities would be considered first for full decommissioning. Drainages with high road densities in Riparian Reserves should also be considered for road decommissioning opportunities.

Consider determining where culverts block fish passage, need to be repaired or replaced, are inadequate to accommodate a 100-year flood, and additional culverts, waterbars, or waterdips would reduce stream network extension.

When fertilizing in the WAU, provide adequate buffers on streams and monitor activities. Where streams or other water bodies have a pH above 8.0 or in municipal watersheds, apply the fertilizer so it would not lead to an increase in pH and/or primary productivity in the stream.

Consider planning regeneration harvests in drainage with the least number of acres in the TSZ less than 30 years old. Consider planning regeneration harvests and commercial thinnings to use existing roads and minimize the amount of new road construction.

Reducing road densities and conducting stream restoration projects would probably be the most effective restoration activities in the WAU. Thinning in the Riparian Reserves should be considered where opportunities exist.

Consider opportunities to adjust Riparian Reserve widths within the WAU. The Riparian Reserve Evaluation Techniques and Synthesis module should be used as a guide when considering adjusting Riparian Reserve widths.

E. Fisheries

1. General Fisheries Recommendations for the WAU

Watershed restoration opportunities may be closely linked to land management activities (i.e. road construction or timber harvesting) for the purposes of mitigating the management activity. Streams with fair or good habitat condition ratings, high species diversity, low gradient, and easily accessible habitat should be priority areas for watershed restoration.

Follow the Terms and Conditions of the National Marine Fisheries Service (NMFS) March 18, 1997 Biological Opinion for road construction, maintenance, and decommissioning; livestock grazing, mining, and riparian rock quarry operation (USDC 1997).

Consider describing how projects occurring within Riparian Reserves meets Aquatic Conservation Strategy (ACS) objectives.

Consider the amount of soil disturbance, timber falling, and yarding within late-successional or old-growth timber stands in Riparian Reserves. Salvage activities in late seral age stands within Riparian Reserves should retard or prevent attainment of ACS objectives.

Consider reducing road densities where peak flows have negatively altered stream channel condition and impacted the fisheries resource. Prioritize the road restoration needs based on information in the Transportation Management Objectives (TMO). Consider decommissioning roads containing the most acres in the Transient Snow Zone and anadromous fish-bearing stream reaches. Priorities for road decommissioning would be valley bottom, midslope, and then ridgetop roads.

Consider using existing roads, as much as possible, when planning land management activities in the WAU. Construct new stream crossings and roads within Riparian Reserves only when necessary.

2. Specific Fisheries Recommendations for the WAU

Culvert barriers were identified in the Rice Creek, Kent Creek, Willis Creek, Van Dine, Judd Creek, and Lane Creek Drainages. Culvert inventories conducted in these drainages concentrated on fish-bearing stream reaches located on BLM-administered lands. However, some inventoried culverts were not in fish-bearing streams. Table 28 identifies the number of inventoried culverts identified as needing to be replaced. Physical condition of the culvert (i.e. rusted or plugged), the culvert's predicted ability to accommodate the 100-year flood event, and whether the culvert provided fish passage were the criteria used to determine culvert replacement needs.

The BLM has limited stream restoration opportunities in the Middle South Umpqua WAU. Approximately three miles of anadromous fish-bearing streams are located on BLM-administered lands in the WAU. Most of the anadromous fish-bearing streams occur in T29S, R7W, Sections 13 and 25 in the Kent Creek and Rice Creek Drainages. Consider installing instream structures (i.e. placing LWD or boulders) in these sections. The structures would provide pool habitat and cover for fish.

Consider following NMFS guidance on timber salvaging in riparian areas. Salvage only the portion of the tree in the road prism, leaving the portion of the tree that reached the stream.

Table 28. Number of Inventoried Culverts in the Middle South Umpqua WAU Needing to be Replaced.

	Number of Culverts Identified for Replacement		
Drainage Name	Fish-bearing Streams	Non-fishbearing Streams	Total
Judd Creek	0	4	4
Kent Creek	1	3	4
Lane Creek	0	4	4
Rice Creek	3	0	3
Van Dine	0	2	2
Willis Creek	0	10	10

F. Wildlife

1. The Northern Spotted Owl

Consider evaluating the timing, spacing, and location of timber harvesting to determine the effects on dispersal and suitable northern spotted owl habitat in the WAU.

2. The Peregrine Falcon

The inventory of potential peregrine falcon habitat is not complete. Consider following specific management guides if high potential peregrine falcon habitat that is found. Management guides include locating a no activity buffer around an active peregrine falcon site, seasonal restrictions during the peregrine falcon breeding season from March 1 to July 15, or maintaining the integrity of medium to high potential sites (USDI 1995). The buffer should include no activity area of one-half to one and one-half mile radius around known occupied sites. A secondary zone (one-half to one and one-half mile radius reflecting the shape of the primary zone) should be established where no management activities, such as timber harvesting, road construction, or helicopters would be allowed during the peregrine falcon breeding season. Activities may resume 14 days after fledgling or nest failure is confirmed. To maintain the integrity of a medium to high potential peregrine falcon nesting site, it should be managed as if it was occupied by including a no activity buffer and seasonal restrictions (March 1 to July 15). Projects that require a disturbance, such as blasting, near any medium to high potential habitat, discovered in the future, should be surveyed before project initiation. Blasting should be restricted if it occurs within three miles of an active or potentially occupied site.

A resource area biologist should be consulted to evaluate how close a project is to peregrine falcon habitat. Consider continuing peregrine falcon habitat evaluation in the WAU.

3. The Marbled Murrelet

Follow the terms and conditions from the USFWS to mitigate disturbance to potential marbled murrelet sites when a project area is located within 1/4 mile of unsurveyed suitable marbled murrelet habitat. Commercial thinning young stands to enhance tree growth would develop large branches and nesting structure to provide suitable marbled murrelet habitat.

4. Other Species of Concern

a. Goshawk

Consider conducting surveys to determine if northern goshawks are present in the WAU. Consider gathering information about other raptor species in the WAU.

b. Mollusks

Consider conducting general surveys in the WAU. Surveys for Survey and Manage mollusk species should be conducted according to established protocol guides before ground disturbing activities, including commercial thinning and herbicide use, are implemented. Surveys would be conducted in the following order 1) clearance surveys of Fiscal Year (FY) 1999 and later projects, 2) survey Riparian Reserves to document species presence or absence, and 3) survey managed habitats and adjacent to Riparian Reserves to evaluate impacts of timber harvesting and other habitat disturbance on specific mollusk sites.

c. Neotropical Birds

Impacts to neotropical birds come from actions modifying habitat. This usually changes the bird species composition using a particular area. Brushing, precommercial and commercial thinning, and broadcast burning activities impact neotropical birds by removing habitat and physically displacing birds. Displacement includes removing occupied habitat during the breeding season.

Ways to benefit neotropical birds would be to reduce impacts from broadcast burning, brushing, regeneration harvesting, precommercial thinning (PCT), commercial thinning, and other activities that manipulate habitat. Scheduling management activities to avoid disturbing birds during nesting and breeding periods should be considered. Local populations of neotropical birds start breeding in April and May and continue through August. However, most species have young capable of flying by the beginning of July or August. Consider implementing projects impacting nesting habitat before April 1 or after July 30 of any given year.

Another way to reduce impacts is to consider the goals of Riparian Reserves when brushing, precommercial thinning, or broadcast burning areas. Consider including different prescriptions when

brushing or thinning in Riparian Reserves. The different prescriptions may exclude Riparian Reserves from the activity or increasing the number of shrubs and non-commercial trees that are retained.

Matrix lands outside of Riparian Reserves also contain brush and non-commercial trees used by neotropical birds. Consider retaining brush and non-commercial trees that are not competing with the desired conifer species. Some projects using these recommendations have been completed. The results should be reviewed and evaluated.

d. Big Game Species (Elk and Deer)

Any approach to elk management would benefit from information about distribution and use of the WAU by elk. This information is not currently available.

Management of road use by people may help elk, deer, and other wildlife. Decommissioning or closing unwanted or unneeded roads and reducing new road construction would increase elk use of undisturbed areas. Seeding decommissioned roads, firebreaks, and open areas with high quality forage and minimizing the visibility of timber harvesting units from roads could increase elk and deer populations. Consider identifying and protecting historic travel corridors and wintering calving areas in the WAU, when possible. Habitat manipulation for elk may conflict with northern spotted owl habitat goals.

X. Summary of Recommendations

Table 29 summarizes the recommendations, based on the main concerns of current conditions in the Middle South Umpqua WAU and identifies the planning objectives to be met by implementing the management strategies and potential activities. The intent of Table 29 was to show the connection between the resource management concerns and the management strategies and recommended activities. The planning objectives are based on legally mandated management direction and policy addressed in the RMP (USDI 1995) and SEIS ROD (USDA and USDI 1994b). The management strategy is intended to describe general methods for meeting the objectives. The management activities are more specific opportunities that may be implemented in order to achieve the management strategy. The data presented in Table 29 is discussed in more detail throughout the watershed analysis.

Table 29. Summary Table of Resource Management Concerns in the Middle South Umpqua WAU.
Vegetation/Silviculture

Concern	Existing Situation	RMP/NFP Planning Objective	Management Strategy	Management Activity
What opportunities exist to manage overstocked stands, which have slower growth rates, are more susceptible to insects and diseases, and have an increased risk of loss due to wind and fire? How can stand density and species composition be influenced to achieve desired late-successional characteristics in the Riparian Reserves?	Approximately 600 acres of well stocked or overstocked stands on BLM-administered land could be treated during the next ten years to maintain growth and healthy stands.	RMP (Appendix E pp.145-154) - Riparian Reserves - Apply silvicultural practices for Riparian Reserves to control stocking and acquire desired vegetation characteristics needed to attain ACS objectives. Matrix - Precommercial, commercial thinning and fertilization would be designed to control stand density, influence species dominance, maintain stand vigor, and place stands on developmental paths.	Manage young stands to maintain or improve growth and vigor, and to improve stand structure and composition to meet ACS objectives.	Precommercial thinning and density management in the Riparian Reserves. Precommercial and commercial thinning in Matrix. Consider precommercially thinning approximately 450 acres in the next ten years. Consider commercial thinning approximately 130 acres in Matrix within the next ten years. Fertilize precommercially or commercially thinned, or slow growing stands in the Matrix. Manipulate PCT slash in all Land Use Allocations. Provide breaks in continuous stand types.
Are there opportunities for Matrix lands within this WAU to provide a sustainable supply of timber and other forest commodities?	Approximately 2,937 acres of late seral stands on BLM-administered land in Matrix are available to help provide a sustainable supply of timber and other forest commodities.	RMP (p. 33) - Objectives for Matrix lands are to produce a sustainable supply of timber and other forest commodities and provide early-successional habitat.	Harvest timber and other forest products on Matrix lands.	Conduct regeneration harvest on Matrix lands in conformance with the RMP. Retain six to eight green trees on GFMA lands and 12 to 14 green trees in Connectivity/Diversity Blocks.

Table 29. Summary Table of Resource Management Concerns in the Middle South Umpqua WAU.
Roads

Concern	Existing Situation	RMP/NFP Planning Objective	Management Strategy	Management Activity
Are BLM managed roads eroding and delivering excess sediment to stream channels and adversely affecting water quality and fish? Are BLM managed roads changing peak flows, impacting stream morphology, or adding to the drainage network in the WAU?	Some BLM roads have been identified to be eroding or having slope stability concerns. Average road density of 4.67 miles per square mile and stream crossing density of 2.06 crossings per stream mile in the WAU may increase sediment in streams that is outside the range of natural variability. Data Gap - No information regarding if BLM managed roads are causing increased sediment in streams, peak flows, or increasing the drainage network.	RMP (pp. 72-74) - Develop and maintain a transportation system to meet the needs of users in an environmentally sound manner. RMP (p. 72) - Correct problems associated with high road density by emphasizing the reduction of minor collector and local road densities where those problems exist. RMP (pp. 19-20, ACS) - Maintain and restore the sediment regime... - The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.	Minimizing new road construction in areas with high surface erosion rates or slope stability problems would help reduce impacts to soils, water quality, and fisheries. Stabilize existing roads where they contribute to significant adverse effects on these resources. Locate, design, construct, and maintain roads to standards meeting management objectives in the district road management plan. Prioritize and address erosion or slope stability concerns caused by roads based on current and potential impacts to riparian resources and the ecological value of the effected riparian resources. Minimize sediment delivery to streams.	Consider conducting road and stream surveys, which would include looking at downcutting of stream channels, road encroachment, and culvert surveys. Possible restoration activities could include road treatments mentioned in the Fisheries section of this table. Prioritize and schedule maintenance on roads identified to be eroding or having slope stability problems. Consider closing, stabilizing, or decommissioning roads identified to be eroding or having slope stability problems, including roads in Riparian Reserves. determined by short-term and long-term transportation and resource management needs.

Table 29. Summary Table of Resource Management Concerns in the Middle South Umpqua WAU.
Hydrology

Concern	Existing Situation	RMP/NFP Planning Objective	Management Strategy	Management Activity
Are BLM administered lands contributing to increased stream temperatures?	DEQ identified the South Umpqua River as water quality limited for stream temperature. Rice Creek had temperatures above 64 degrees Fahrenheit during part of the summer in 1998, which is higher than the maximum stream temperature water quality standard. Data Gaps - Limited amount of water quality data on BLM-administered lands.	RMP (pp. 19-20, ACS) - Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain in the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities. RMP (p. 35) - As directed by the Clean Water Act, comply with state water quality requirements to restore and maintain water quality to protect the recognized beneficial uses for the South Coast and Umpqua Basins.	Control stocking, reestablish and manage stands, and acquire desired vegetation characteristics to attain Aquatic Conservation Strategy objectives. Address Data Gaps regarding water quality information on BLM-administered lands, over time and as funding allows.	Consider thinning in Riparian Reserves. Plant conifers and maintain vegetation in Riparian Reserves to allow trees to grow and provide shade in a shorter amount of time. Consider collecting water quality data (such as pH, temperature, or dissolved oxygen) on BLM-administered lands to determine if they are contributing to water quality concerns.

Table 29. Summary Table of Resource Management Concerns in the Middle South Umpqua WAU.
Fisheries

Issue	Existing Situation	RMP/NFP Planning Objective	Management Strategy	Management Activity
What opportunities exist to enhance the fisheries resource and/or the habitat?	The Umpqua River cutthroat trout and Oregon Coast coho salmon are listed as endangered and threatened species, respectively under the ESA. These species have been documented to occur in this WAU.	RMP (p. 40) - Promote the rehabilitation and protection of fish stocks at risk and their habitat. RMP (p. 41) - Protect, manage, and conserve Federal listed and proposed species and their habitats to achieve their recovery in compliance with the Endangered Species Act, approved recovery plans, and Bureau special status species.	a. Protect existing stream habitat conditions, water quality, and water quantity. b. Focus restoration on: 1. providing fish passage at failed or failing stream crossing sites, especially those sites located in anadromous fish-bearing stream reaches, 2. maintaining, upgrading, or decommissioning roads identified in the TMOs (see Appendix G), 3. conducting in-stream restoration, which may include in-stream structures and riparian improvement projects.	a. Consider using timing and spatial arrangement of timber harvesting and other major land disturbance activities (i.e. road construction) within this WAU to reduce adverse effects on fish species. b. Possible restoration activities could include, but may not be limited to, fish passage improvements, stabilizing roads and road fills, sidecast pullback, adding cross drains on roads with poor drainage, resurfacing existing rock roads, surfacing natural surfaced roads, blocking and subsoiling roads to reduce road density and road related sediment production, placing logs and boulders in streams to create spawning and rearing habitat, placing fine and coarse materials for over-wintering habitat, and establishing or releasing existing conifers in riparian areas.

Table 29. Summary Table of Resource Management Concerns in the Middle South Umpqua WAU.
Wildlife

Concern	Existing Situation	RMP/NFP Planning	Management Strategy	Management Activity
How can suitable habitat around the spotted owl sites be managed following the Standards and Guidelines to minimize effects on the spotted owl?	One spotted owl site is located in the WAU. It is below the threshold level of 40% suitable habitat within a 1.3 mile radius around the owl activity center.	RMP (p. 41) - Protect, manage, and conserve Federal listed and proposed species and their habitats to achieve their recovery in compliance with the Endangered Species Act, approved recovery plans, and Bureau special status species.	RMP (p.48) - Retain 100 acres of the best northern spotted owl habitat as close to the nest site or owl activity center as possible for all known (as of January 1, 1994) spotted owl activity centers. Human activity within 1/4 mile of nest sites which could disturb owl nesting activities will be restricted, especially the use of large power equipment and falling of trees. Restrictions will apply from March 1 to September 30 or until non-nesting status is confirmed using protocol procedures. The retention of adequate habitat conditions for dispersal of the northern spotted owl will be taken into account during watershed analysis that addresses the issue of adjusting Riparian Reserve widths.	Consider using timing and location of habitat removal or modification on the landscape to reduce effects within known territories. Plan timber harvesting activities that consider owl site condition, connection to other habitat, and the ranking of the owl sites in this analysis. Consider conducting near future timber harvesting activities outside of known 1.3 mile territories or in the periphery of the territory and outside of the 0.7 mile radius of known activity centers, when possible.

Table 29. Summary Table of Resource Management Concerns in the Middle South Umpqua WAU.
Wildlife

Concern	Existing Situation	RMP/NFP Planning	Management Strategy	Management Activity
Is there marbled murrelet habitat in the WAU?	There are approximately 585 acres of suitable marbled murrelet habitat in the WAU.	RMP (p. 41) - Protect, manage, and conserve Federal listed and proposed species and their habitats to achieve their recovery in compliance with the Endangered Species Act, approved recovery plans, and Bureau special status species.	Protect contiguous marbled murrelet habitat within a 0.5 mile radius of any occupied site (e.g. active nest, fecal ring, or eggshell fragments, and birds flying below, through, into, or out of the forest canopy within or adjacent to a stand). Restrict human activity within occupied or nesting stands between March 1 and July 15. Protect or enhance suitable or replacement habitat during silvicultural treatments in areas not considered to be marbled murrelet habitat within the 0.5 mile radius.	Conduct two years of surveys before disturbing marbled murrelet habitat within zone 2 (about 50 miles from the coast).
Are there survey and manage mollusk species present in the WAU?	Five survey and manage mollusk species are present in Douglas County.	RMP (p. 41) - Protect SEIS Special Attention Species so as not to elevate their status to any higher level of concern.	Collect information on survey and manage mollusk species present in the WAU. Identify what type of or how much habitat is necessary.	Consider conducting general surveys in all LUAs using established protocols to identify population distribution across the landscape. Consider conducting pre- and postharvest surveys to monitor effects on mollusks. Conduct clearance surveys prior to implementing ground disturbing activities.

Table 29. Summary Table of Resource Management Concerns in the Middle South Umpqua WAU.
Wildlife

Concern	Existing Situation	RMP/NFP Planning	Management Strategy	Management Activity
Is there potential Del Norte salamander habitat within the WAU? Is the WAU within 25 miles of a known site? Is the Del Norte salamander present in the WAU?	Talus habitat associated with stands that are at least 80 years old occur on BLM-administered land in the WAU. The entire WAU is within 25 miles of a known Del Norte salamander site. This salamander may be in the WAU but has not been documented to occur in the WAU.	The Del Norte salamander is a Protection Buffer and a Survey and Manage Survey Strategy 2 Species. RMP (p.41) - Protect SEIS Special Attention Species so as not to elevate their status to any higher level of concern.	RMP (p.45) - Survey prior to activities and manage sites within the known or suspected ranges and within the habitat types of vegetation communities associated with the Del Norte salamander.	Consider conducting surveys using protocol methods to determine if suitable habitat occurs in the WAU. Conduct surveys for the Del Norte salamander prior to ground disturbing activities in the WAU.
The northern goshawk is a Bureau Sensitive species. Is there northern goshawk habitat within the WAU?	The northern goshawk is not common in the Roseburg BLM District. The geographic range of the species includes the Roseburg BLM District. There is potential habitat on lands within the WAU, based on GIS.	RMP (p. 41) - Manage for the conservation of Federal Candidate and Bureau Sensitive species and their habitats so as not to contribute to the need to list and to recover the species.	RMP (p. 49) - Retain 30 acre buffers of undisturbed habitat around active and alternative nest sites. Restrict human activity and disturbance within 1/4 mile of active sites between March and August or until such time as young have dispersed. Consider this species when planning or implementing ground disturbing projects.	Consider conducting field reviews to verify and evaluate potential habitat. Use standard protocol survey methods to clear areas where projects may remove or modify suitable habitat. Consider identifying and managing a post fledgling area around an activity center.
Are there neotropical bird species present in the WAU?	Neotropical bird species use the WAU for breeding, feeding, or foraging.	RMP (p. 37) - Enhance and maintain biological diversity and ecosystem health to contribute to healthy wildlife populations.	Use the watershed analysis process to address wildlife habitat issues for individual watersheds.	For projects in the WAU impacting neotropical habitat consider using seasonal restrictions, timing, different prescriptions, and other vegetation manipulation activities to mitigate impacts, when possible.

XI. Monitoring

General objectives of monitoring are:
1) To determine if the plan is being implemented correctly,
2) Determine the effectiveness of management practices at multiple scales, ranging from individual sites to watersheds,
3) Validate whether ecosystem functions and processes have been maintained as predicted.

The Roseburg RMP, Appendix I provides monitoring guidelines for various Land Use Allocations and resources discussed in the plan. Some implementation, effectiveness, and validation monitoring questions are addressed. Management actions on the Roseburg BLM District may be monitored prior to project initiation and following project completion, depending on the resource or activity being monitored.

Some key resource elements that may be monitored in the Middle South Umpqua WAU are as follows:

A. All Land Use Allocations

Are surveys for the species listed in the Roseburg District RMP, Appendix H conducted before ground disturbing activities occur?
Are protection buffers being provided for specific rare and locally endemic species and other species in the upland forest matrix?
Are the sites of amphibians, mammals, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropod species listed in Appendix H of the Roseburg District RMP being surveyed?
Are the sites of amphibians, mammals, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropod species listed in Appendix H of the Roseburg District RMP being protected?
Are high priority sites for species management being identified?

B. Riparian Reserves

Is the width and integrity of the Riparian Reserves maintained?
Are management activities within Riparian Reserves consistent with SEIS ROD Standards and Guidelines, RMP management direction, and Aquatic Conservation Strategy objectives?
Has Watershed Analysis been completed prior to on-the-ground actions being initiated in Riparian Reserves?

C. Matrix

Are suitable numbers of snags, coarse woody debris, and green trees being left following timber harvesting as called for in the SEIS ROD Standard and Guidelines and Roseburg RMP management direction?
Are timber sales being designed to meet ecosystem objectives for the Matrix?
Are forests growing at a rate that will produce the predicted yields?
Are forests in the Matrix providing for connectivity between Late-Successional Reserves?

XII. Revisions to the Watershed Analysis and Data Gaps

Watershed analysis is an ongoing, iterative process designed to help define important resource information needed for making sound management decisions. This watershed analysis would, generally, be updated as existing information is refined, new data becomes available, new issues develop, when significant changes occur in the WAU, or as management needs dictate.

Appendix A

Glossary

Appendix A

Glossary

Age Class - One of the intervals into which the age range of trees is divided for classification or use.

Anadromous Fish - Fish that are born and reared in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce. Salmon, steelhead, and shad are examples.

Aquatic Conservation Strategy - Plan developed in Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl, designed to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and restore currently degraded habitats.

Beneficial Use - The reasonable use of water for a purpose consistent with the laws and best interest of the peoples of the state. Such uses include, but are not limited to, the following: instream, out of stream and groundwater uses, domestic, municipal, industrial water supply, mining, irrigation, livestock watering, fish and aquatic life, wildlife, fishing, water contact recreation, aesthetics and scenic attraction, hydropower, and commercial navigation.

Best Management Practices (BMPs) - Methods, measures, or practices designed to prevent or reduce water pollution. Not limited to structural and nonstructural controls, and procedures for operations and maintenance. Usually, Best Management Practices are applied as a system of practices rather than a single practice.

Bureau Assessment Species - Plant and animal species on List 2 of the Oregon Natural Heritage Data Base, or those species on the Oregon List of Sensitive Wildlife Species (OAR 635-100-040), which are identified in BLM Instruction Memo No. OR-91-57, and are not included as federal candidate, state listed or Bureau sensitive species.

Bureau Sensitive Species - Plant or animal species eligible for federal listed, federal candidate, state listed, or state candidate (plant) status, or on List 1 in the Oregon Natural Heritage Data Base, or approved for this category by the State Director.

Candidate Species - Those plants and animals included in Federal Register "Notices of Review" that are being considered by the United States Fish and Wildlife Service (FWS) for listing as threatened or endangered.

> Category 1. Taxa for which the Fish and Wildlife Service has substantial information on hand to support proposing the species for listing as threatened or endangered. Listing proposals are either being prepared or have been delayed by higher priority listing work.

Commercial Thinning - The removal of merchantable trees from an even-aged stand to encourage growth of the remaining trees.

Connectivity - A measure of the extent to which conditions between late-successional/old-growth forest areas provide habitat for breeding, feeding, dispersal, and movement of late-successional/old-growth-associated wildlife and fish species.

Connectivity/Diversity Block - A land use classification under Matrix lands managed on 150 year area control rotations. Periodic timber sales will leave 12 to 18 green trees per acre.

Core Area - That area of habitat essential in the breeding, nesting and rearing of young, up to the point of dispersal of the young.

Critical Habitat - Under the Endangered Species Act, (1) the specific areas within the geographic area occupied by a federally listed species on which are found physical and biological features essential to the conservation of the species, and that may require special management considerations or protection; and (2) specific areas outside the geographic area occupied by a listed species when it is determined that such areas are essential for the conservation of the species.

Density Management - Cutting of trees for the primary purpose of widening their spacing so that growth of remaining trees can be accelerated. Density management harvest can also be used to improve forest health, to open the forest canopy, or to accelerate the attainment of old growth characteristics if maintenance or restoration of biological diversity is the objective.

District Defined Reserves (DDR) - Areas designated for the protection of specific resources, flora and fauna, and other values. These areas are not included in other land use allocations nor in the calculation of the Probable Sale Quantity.

Endangered Species - Any species defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range and published in the Federal Register.

Endemic - Native or confined to a certain locality.

Environmental Assessment (EA) - A systematic analysis of site-specific BLM activities used to determine whether such activities have a significant effect on the quality of the human environment and whether a formal environmental impact statement is required; and to aid an agency's compliance with National Environmental Protection Agency when no Environmental Impact Statement is necessary.

Ephemeral Stream - Streams that contain running water only sporadically, such as during and following storm events.

50-11-40 Rule - A proposed guideline requiring maintenance of adequate spotted owl dispersal habitat on lands outside designated "habitat conservation areas" for the Northern Spotted Owl. On a quarter township basis, 50 percent of the stands would have conifers averaging 11 inches DBH and a 40 percent canopy closure.

Fluvial - Migratory behavior of fish moving away from the natal stream to feed, grow, and mature then returning to the natal stream to spawn.

General Forest Management Area (GFMA) - Forest land managed on a regeneration harvest cycle of 70-110 years. A biological legacy of six to eight green trees per acre would be retained to assure forest health. Commercial thinning would be applied where practicable and where research indicates there would be gains in timber production.

GIS - Geographic Information System, a computer based mapping system used in planning and analysis.

Intermittent Stream - Any nonpermanent flowing drainage feature having a definable channel and evidence of scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria.

Issue - A matter of controversy or dispute over resource management activities that is well defined or topically discrete. Addressed in the design of planning alternatives.

Land Use Allocations - Allocations which define allowable uses/activities, restricted uses/activities, and prohibited uses/activities. They may be expressed in terms of area such as acres or miles etc. Each allocation is associated with a specific management objective.

Late-Successional Forests - Forest seral stages which include mature and old-growth age classes.

Late-Successional Reserve (LSR) - A forest in its mature and/or old-growth stages that has been reserved.

Matrix Lands - Federal land outside of reserves and special management areas that will be available for timber harvest at varying levels.

Mitigating Measures - Modifications of actions which (a) avoid impacts by not taking a certain action or parts of an action; (b) minimize impacts by limiting the degree or magnitude of the action and its implementation; (c) rectify impacts by repairing, rehabilitating or restoring the affected environment; (d) reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or (e) compensate for impacts by replacing or providing substitute resources or environments.

Monitoring - The process of collecting information to evaluate if objectives and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned.

Nonpoint Source Pollution - Water pollution that does not result from a discharge at a specific, single location (such as a single pipe) but generally results from land runoff, precipitation, atmospheric deposition or percolation, and normally is associated with agricultural, silvicultural and urban runoff, runoff from construction activities, etc. Such pollution results in the human-made or human-induced alteration of the chemical, physical, biological, radiological integrity of water.

Orographic - Of or pertaining to the physical geography of mountains and mountain ranges.

Peak Flow - The highest amount of stream or river flow occurring in a year or from a single storm event.

Perennial Stream - A stream that has running water on a year round basis.

Phenotypic - Of or pertaining to the environmentally and genetically determined observable appearance of an organism.

Precommercial Thinning (PCT) - The practice of removing some of the trees less than merchantable size from a stand so that remaining trees will grow faster.

Probable Sale Quantity (PSQ) - Probable sale quantity estimates the allowable harvest levels for the various alternatives that could be maintained without decline over the long term if the schedule of harvests and regeneration were followed. "Allowable" was changed to "probable" to reflect uncertainty in the calculations for some alternatives. Probable sale quantity is otherwise comparable to allowable sale quantity (ASQ). However, probable sale quantity does not reflect a commitment to a specific cut level. Probable sale quantity includes only scheduled or regulated yields and does not include "other wood" or volume of cull and other products that are not normally part of allowable sale quantity calculations.

Proposed Threatened or Endangered Species - Plant or animal species proposed by the U.S. Fish & Wildlife Service or National Marine Fisheries Service to be biologically appropriate for listing as threatened or endangered, and published in the Federal Register. It is not a final designation.

Resident Fish - Fish that are born, reared, and reproduce in freshwater.

Resource Management Plan (RMP) - A land use plan prepared by the BLM under current regulations in accordance with the Federal Land Policy and Management Act.

Riparian Reserves - Designated riparian areas found outside Late-Successional Reserves.

Riparian Zone - Those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables and soils which exhibit some wetness characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of these rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs and wet meadows.

Stream Order - A hydrologic system of stream classification. Each small unbranched tributary is a first order stream. Two first order streams join to form a second order stream. A third order stream has only first and second order tributaries, and so on.

Stream Reach - An individual first order stream or a segment of another stream that has beginning and ending points at a stream confluence. Reach end points are normally designated where a tributary confluence changes the channel character or order. Although reaches identified by BLM are variable in length, they normally have a range of ½ to 1-1/2 miles in length unless channel character, confluence distribution, or management considerations require variance.

Survey and Manage - Those species that are listed in Table C-3 of the Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl for which four survey strategies are defined.

Tillage - Breaking up the compacted soil mass to promote the free movement of water and air using a self drafting individual tripping winged subsoiler.

Transportation Management Objectives (TMO) - An evaluation of the current BLM transportation system to assess future need for roads, and identify road problem areas which need attention, and address future maintenance needs.

Watershed - The drainage basin contributing water, organic matter, dissolved nutrients, and sediments to a stream or lake.

Watershed Analysis - A systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives. Watershed analysis is a stratum of ecosystem management planning applied to watersheds of approximately 20 to 200 square miles.

Appendix B

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Appendix B - References

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Appendix C
Fisheries

Table C-1. Summary Table of Current Conditions in the Middle South Umpqua WAU.

Drainage Name Subwatershed Name	Road Density	Stream Density	Percent BLM-administered land	Stream Crossing Density	Percent Less Than 30 Years Old (BLM)	Percent of Riparian Reserves at Least 80 Years Old
Dillard	4.39	4.94	1	1.34	0	100
Kent Creek	3.91	6.57	17	1.70	22	41
Rice Creek	4.90	5.97	23	2.31	21	23
Kent Rice Subwatershed	4.49	5.90	16	1.92	21	32
Judd Creek	3.91	7.35	34	1.74	25	61
Lane Creek	3.86	6.62	23	2.19	46	59
Tri City North	5.39	6.61	8	1.99	33	50
Tri City South	5.74	4.86	8	2.69	0	51
Lane Judd Subwatershed	4.92	6.21	17	2.13	26	59
Clark Branch	4.12	6.07	2	2.00	0	73
Van Dine	4.89	6.64	10	2.38	29	18
Willis Creek	5.46	7.14	20	2.14	40	20
Willis Vandine Subwatershed	4.66	6.49	9	2.11	32	23
Middle South Umpqua WAU	4.67	6.26	13	2.06	26	39

Table C-2. Habitat Bench Marks Related to Category Types

Pools	Bench Mark Weighing Scale 1-5	4-Excellent	3-Good	2-Fair	1-Poor	Row Totals
a) Pool Area %	2	≥ 45	30-44	16-29	≤ 15	
b) Residual Pool						
Small (1-3 ordered)	4	≥ 0.55	0.35 - 0.54	0.15 - 0.34	0 - 0.14	
Large (4th order and greater)	4	≥ 0.95	0.76 - 0.94	0.46 - 0.75	≤ 0.45	
Riffles						
a) Width/Depth (wetted) (ODFW)	3	≤ 10.4	10.5 - 20.4	20.5 - 29.4	≥ 29.5	
b) Width/Depth (bank full) (USFS)	3	≤ 10	11 - 15	16 - 19	≥ 20	
c) Silt/Sand/Organics (% area) (ODFW)	2	≤ 1	2 - 7	8 - 14	≥ 15	
d) Embeddedness (% by unit) (USFS)	2	0	1 - 25	26 - 49	≥ 50	
e) Gravel % (Riffles)	3	≥ 80	30 - 79	16 - 29	≤ 15	
f) Substrate dominant	3	Gravel	Cobble	Cobble	Bedrock	
subdominant (USFS)	2	Cobble	Large Boulder	Small Boulder	Anything	
Reach Average						
a) Riparian condition Species dom/subdom. (> 15 cm)	2	conifer/hdwd* Klam - hdwd*	conifer/hdwd* Klam - hdwd*	hdwd*/conifer	alder/anything	
Size (Conifers)	3	≥ 36" Klam - ≥ 24"	24 - 35" Klam - 12 - 23"	7 - 23"	≤ 6"	
b) Shade (%) (ODFW)						
Stream Width < 12 M	1	≥ 80	71 - 79	61 - 70	≤ 60	
Stream Width > 12 M	1	≥ 70	61 - 69	51 - 60	≤ 50	
LWD						
a) Pieces (lg/sm) 100 M Stream	3	≥ 29.5	19.5 - 29.4	10.5 - 19.4	≤ 10.4	
b) Vol/100 M Stream	2	≥ 39.5	29.5 - 39.4	20.5 - 29.4	≤ 10.4	
USFS - Pieces 50' or more long and 24" DBH per mile	5	≥ 70	45 - 69	31 - 44	≤ 30	
Temperatures	1	≤ 55	56 - 60	61 - 69	≥ 70	
Macroinvertebrates						
Totals for Category						

* Hardwood category does not include alder.

*Where USFS designations appear, either USFS or ODFW measurements may be used but not both.

HABITAT BENCHMARK RATING SYSTEM

100 - 82 EXCELLENT
81 - 63 GOOD
62 - 44 FAIR
43 - 25 POOR

Table C-3. ODFW Aquatic Habitat Inventory Data.

Stream	Reach	% Pool Area	Residual Pool Depth	Riffle W/D Ratio	% Fines in Riffles	% Gravel in Riffles	Riparian Vegetation (dominant/subdominant)	Riparian Conifer Size	% Shade	LWD pieces per 100 meters	LWD vol per 100 meters	Aquatic Habitat Rating
Barrett Creek	1	7.0	0.3	14.6	4	47	hardwood/conifer	small	91	0.6	0.5	Poor
	2	4.0	0.3	16.2	0	41	hardwood/conifer	medium	96	3.0	10.2	Fair
Clark Branch	1	--	--	--	--	--	--	--	--	--	--	--
	2	1.8	0.3	--	--	--	hardwood/conifer	medium	65	0.8	0.9	Poor
Judd Creek	1	40.1	0.5	19.4	10	41	hardwood/conifer	small	90	1.6	0.9	Fair
	2	16.3	0.3	20.8	11	31	hardwood/conifer	small	96	5.4	3.1	Fair
	3	17.4	0.3	29.0	10	30	hardwood/conifer	small	92	10.1	10.5	Fair
	4	23.1	0.4	15.8	10	54	hardwood/conifer	small	87	10.8	24.3	Fair
	5	6.9	0.4	6.7	11	60	conifer/hardwood	medium	74	15.4	23.9	Fair
Kent Creek	1	--	0.0	--	--	--	hardwood/conifer	small	89	1.2	0.5	Poor
	2	1.3	0.4	44.5	5	75	hardwood/conifer	small	84	1.3	1.2	Fair
	3	4.3	0.5	35.0	0	75	hardwood/conifer	small	73	1.7	0.7	Fair
	4	2.8	0.5	22.1	13	75	hardwood/conifer	small	87	2.8	4.4	Fair
	5	0.7	0.3	--	--	--	hardwood/conifer	small	96	2.2	7.0	Poor
Lane Creek	1	7.9	0.1	75.0	10	60	hardwood/conifer	small	70	5.0	1.3	Poor
	2	5.6	0.4	33.1	8	35	hardwood/conifer	medium	93	4.4	2.1	Fair
	3	4.5	0.5	28.2	5	46	hardwood/conifer	medium	96	2.1	2.7	Fair
	4	0.2	--	15.1	0	73	conifer/hardwood	medium	94	7.2	16.9	Poor

Table C-3. ODFW Aquatic Habitat Inventory Data.

Stream	Reach	% Pool Area	Residual Pool Depth	Riffle W/D Ratio	% Fines in Riffles	% Gravel in Riffles	Riparian Vegetation (dominant/subdominant)	Riparian Conifer Size	% Shade	LWD pieces per 100 meters	LWD vol per 100 meters	Aquatic Habitat Rating
Rice Creek	1	22.0	0.4	--	1	84	hardwood/conifer	medium	84	0.9	0.8	Fair
	2	12.0	0.4	19.5	0	65	hardwood/conifer	small	55	0.2	0	Fair
	3	33.0	0.4	19.5	1	66	hardwood/conifer	small	85	1.3	2.1	Fair
	4	5.0	0.4	10.0	0	78	hardwood/conifer	small	93	0.5	1.9	Fair
Willis Creek	1	67.7	0.4	30.7	21	53	hardwood/conifer	small	57	2.7	1.5	Poor
	2	76.2	0.4	17.8	24	52	hardwood/conifer	small	69	0.2	0.1	Fair
	3	--	--	--	--	--	--	--	--	--	--	Poor
	4	34.7	0.3	20.5	11	63	hardwood/conifer	medium	75	1.8	1.3	Fair
	5	8.8	0.2	10.0	10	70	hardwood/conifer	small	82	15.3	19.6	Fair
West Fork of Willis Creek	1	46.9	0.4	15.1	9	60	hardwood/conifer	medium	70	2.7	1.5	Fair
	2	55.8	0.5	26.5	15	58	conifer/hardwood	medium	72	2.6	1.7	Fair
	3	50.9	0.3	20.3	14	38	hardwood/conifer	medium	70	1.8	1.1	Fair
	4	41.2	0.3	15.0	20	20	hardwood/conifer	medium	66	7.5	7.4	Poor
	5	53.4	0.3	13.3	6	82	hardwood/conifer	small	74	26.5	62.3	Good

AHR = Aquatic Habitat Rating
-- = no data available

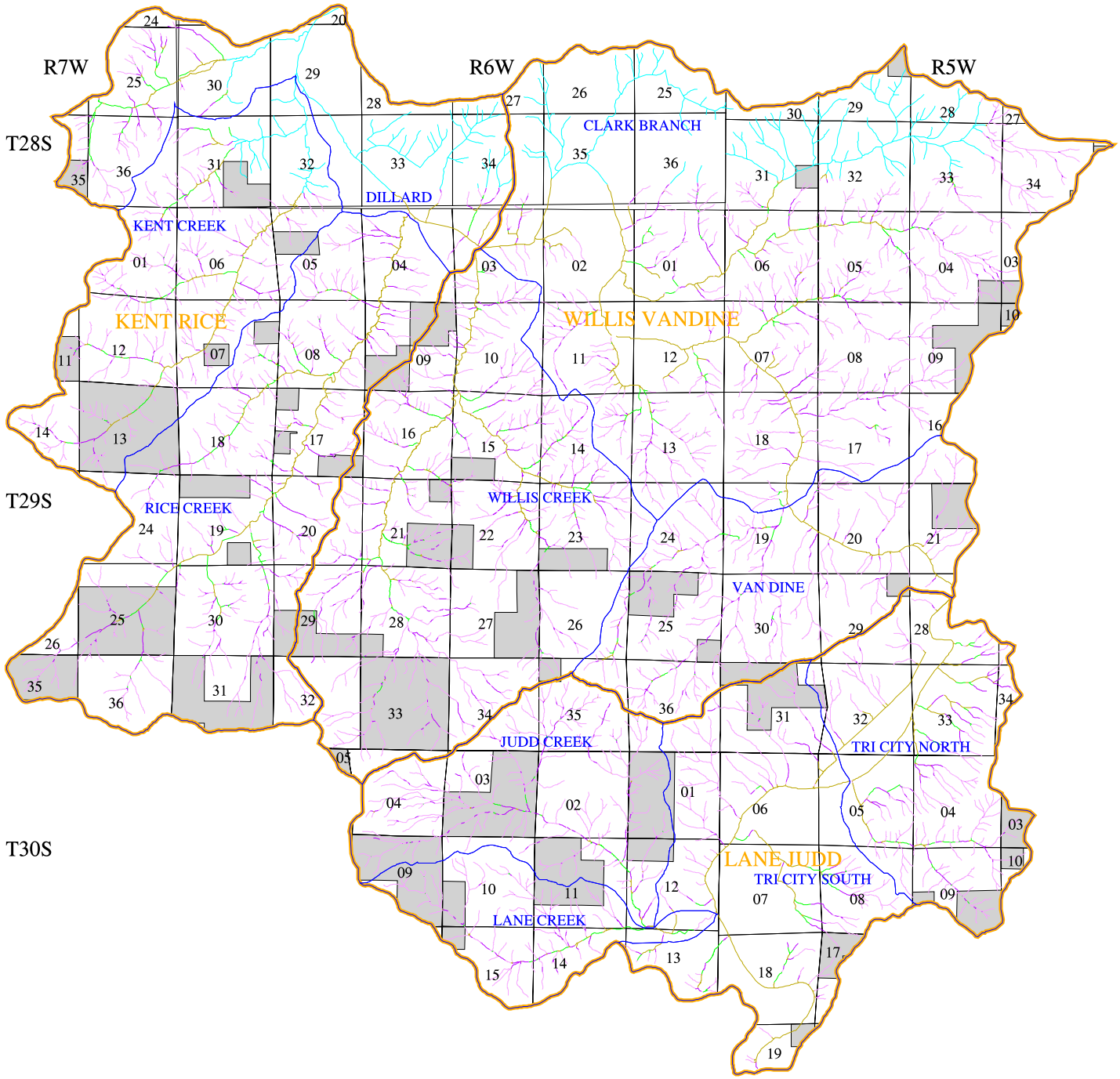
Appendix D

Hydrology

Table D-1. Rosgen Level I Stream Classification of Selected Streams within the Middle South Umpqua WAU (using GIS Stream Gradients).

Drainage Name	Percent of Drainage by Rosgen Stream Channel				
	C or F (Slope = 0.001-0.02)	**B (Slope = 0.02-0.039)**	**A (Slope = 0.04-0.099)**	**Aa+ (Slope >0.10)**	**No data**
Dillard	12	10	12	23	42
Kent Creek	22	7	9	62	–
Rice Creek	13	6	16	66	–
Judd Creek	1	3	11	85	–
Lane Creek	6	6	10	78	–
Tri City North	20	6	14	60	–
Tri City South	24	7	12	57	–
Clark Branch	13	4	9	55	19
Van Dine	8	3	11	78	–
Willis Creek	10	5	14	71	–

Map D-1. Middle South Umpqua Watershed Analysis Unit
Rosgen Level 1 Stream Channel Types



0 1 2 3 4 5 Miles

1:104648

- Drainages
- Subwatershed

Rosgen Channel Types (Percent Slope)

- C or F (Less than 2% Slope)
- B or G (2% to 4% Slope)
- A (4% to 10% Slope)
- Aa+ (Greater Than 10% Slope)
- No Data
- Section Lines
- BLM Administered Lands

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Appendix E
Wildlife

Table E-1. Special Status Wildlife Species in the Middle South Umpqua WAU.			
Species	**Status**	**Presence**	**Monitoring Level**
VERTEBRATES			
FISH			
Coho Salmon (Oncorhynchus kisutch)	FT, SC, AS	D	3
Umpqua Chub (Oregonichthys kalawatseti)	SoC, SV, BS	S	1
Umpqua Basin Cutthroat Trout (Oncorhynchus clarki)	FE	D	3
Pacific Lamprey (Lampetra ayresi)	SoC, BS	D	3
Steelhead Trout (Oncorhynchus mykiss)	FP	D	3
AMPHIBIANS AND REPTILES			
Clouded Salamander (Aneides ferrous)	SU, AS	D	3
Del Norte Salamander (Plethodon elongatus)	S&M, SoC, SV, BS	U	1
Northern Red-legged Frog (Rana aurora aurora)	SoC, SU, BS	D	3
Southern Torrent Salamander (Rhyacotriton variegatus)	SoC, SC, BS	S	1
Western Toad (Bufo boreas)	SV, BT	S	1
California Mountain Kingsnake (Lampropeltis zonata)	SV, AS	S	1
Common Kingsnake (Lampropeltis getulus)	SV, AS	S	1
Northwestern Pond Turtle (Clemmys marmorata marmorata)	SoC, SC, BS	D	3
Sharptail Snake (Contia tenuis)	SV, AS	S	3
BIRDS			
Marbled Murrelet (Brachyramphus marmoratus marmoratus)	FT, ST, CH	S	3
Bald Eagle (Haliaeetus leucocephalus)	FT, ST	S	1
Northern Goshawk (Accipiter gentilis)	SoC, SC, BS	S	3
Peregrine Falcon (Falco peregrinus anatum)	FE, ST	S	3
Great Gray Owl (Strix nebulosa)	S&M, SV, AS	S	1
Northern Spotted Owl (Strix occidentalis caurina)	FT, ST, CH	D	4
Pygmy Owl (Glaucidium gnoma)	SU	D	3

Table E-1. Special Status Wildlife Species in the Middle South Umpqua WAU.			
Species	**Status**	**Presence**	**Monitoring Level**
Northern Saw-whet Owl (Aegolius acadicus)	AS	S	3
Acorn Woodpecker (Melanerpes formicivorous)	SU	S	1
Lewis' Woodpecker (Melanerpes lewis)	SC, AS	U	1
Pileated Woodpecker (Dryocopus pileatus)	SV, AS	D	3
Little Willow Flycatcher (Empidonax traillii brewsteri)	SoC, BS	S	1
Purple Martin (Progne subis)	SC, AS	D	3
Pygmy Nuthatch (Sitta pygmae)	SV	U	1
Western Bluebird (Sialia mexicana)	SV, AS	D	3
Oregon Vesper Sparrow (Pooecetes gramineus)	SC, BT	U	1
MAMMALS			
Fringed Myotis (Myotis thysanodes)	SoC, SV, BS, S&M	S	1
Long-eared Myotis (Myotis evotis)	SoC, BS, S&M	S	1
Long-legged Myotis (Myotis volans)	SoC, BS, S&M	S	1
Pacific Pallid Bat (Antrozous pallidus)	S&M, SC, AS	S	1
Silver Haired Bat (Lasionycteris noctivagans)	BT	S	1
Townsend's Big-eared Bat (Corynorhinus townsendii)	SoC, SC, BS	S	1
Yuma Myotis (Myotis yumanensis)	SoC, BS	S	1
Ringtail (Bassariscus astutus)	SU	S	1
American Marten (Martes americana)	SC, AS	S	1
Pacific Fisher (Martes pennanti pacifica)	SoC, SC, BS	U	1
California Wolverine (Gulo gulo luteus)	SoC, BS	U	1
North American Lynx (Felis lynx canadensis)	S&M	U	1
White-footed Vole (Arborimus albipes)	SoC, BS, SP	S	1
Red Tree Vole (Arborimus longicaudus)	S&M	D	3

Table E-1. Special Status Wildlife Species in the Middle South Umpqua WAU.

Species	Status	Presence	Monitoring Level
INVERTEBRATES			
Blue-gray Taildropper (Prophysaon coeruleum)	S&M	S	3
Oregon Shoulderband (Helminthoglypta hertleini)	S&M	S	3
Oregon Megomphix (Megomphix hemphilli)	S&M	S	3
Papillose Taildropper (Prophysaon dubium)	S&M	S	3
Alsea Ochrotichian Micro Caddisfly (Ochrotrichia alsea)	SoC, BS	U	1
Denning's Agapetus Caddisfly (Agapetus denningi)	SoC, BS	U	1
Vertree's Ochrotichian Micro Caddisfly (Ochrotrichia vertreesi)	SoC, BS	U	1
Franklin's Bumblebee (Bombus franklini)	SoC, BS	U	1

STATUS ABBREVIATIONS:	**PRESENCE ABBREVIATIONS**:
FE -- Federal Endangered	**D** -- Documented by surveys or identified in the field
FT -- Federal Threatened	**S** -- Suspected habitat present
FP -- Federal Proposed	**U** -- Uncertain
FC -- Federal Candidate	
SoC – Federal Species of Concern	August 14, 1997 R.H. Espinosa
CH -- Critical Habitat Designated	**MONITORING LEVELS USED TO DOCUMENT SPECIES:**
SE -- State Endangered	**N** -- No surveys done or planned
ST -- State Threatened	**1** -- Literature search only
SC -- ODFW Critical	**2** -- One field search done
SV -- ODFW Vulnerable	**3** -- Some surveys completed
SP -- ODFW Peripheral/Naturally Rare	**4** -- Protocol completed
SU – ODFW Undetermined	
BS – Bureau Sensitive Species (BLM) - This status reflects interim guidelines for former FC1 and FC2 species in instruction communication from the Oregon State Office (March 7, 1996) and IM-OR-97-118 (April 30,1997).	
AS -- Bureau Assessment Species (BLM)	
BT -- Bureau Tracking Species (BLM)	**S&M** – Survey and Manage (ROD)

Appendix F

Plants

Appendix F

Table F-1. Survey and Manage Plant Species Suspected to Occur in the Middle South Umpqua WAU.

Species	Survey Strategy			
	1	2	3	4
Vascular plants				
Allotropa virgata[d]	X	X		
Aster vialis[d]	X	X		
Bensoniella oregana[d]	X	X		
Cypripedium fasciculata	X	X		
Cypripedium montanum[d]	X	X		
Fungi				
Rare False Truffles				
Gautieria otthii	X		X	
False Truffles				
Rhizopogon truncatus			X	
Chanterelles				
Cantharellus cibarius[d]			X	X
Cantharellus subalbidus			X	X
Cantharellus tubaeformis[d]			X	X
Rare Chanterelle				
Chantharellus formosus	X		X	
Chanterelles - Gomphus				
Gomphus clavatus			X	
Gomphus floccosus[d]			X	
Gomphus kauffmannii			X	

Appendix F

Table F-1. Survey and Manage Plant Species Suspected to Occur in the Middle South Umpqua WAU.

Species	Survey Strategy			
	1	2	3	4
Tooth Fungi				
Hydnum repandum[d]			X	
Hydnum umbilicatum[d]			X	
Rare Resupinates and Polypores				
Gyromitra esculenta[d]			X	X
Gyromitra infula			X	X
Otidea leporina[d]			X	
Otidea onotica[d]			X	
Otidea smithii	X		X	
Sarcosoma mexicana[d]			X	
Sarcosoma eximia			X	
Rare Cup Fungi				
Aleuria rhenana	X		X	
Helvella compressa[d]	X		X	
Helvella maculata	X		X	
Coral Fungi				
Clavicorona avellanea[d]			X	
Jelly Mushroom				
Phlogoitis helvelloides[d]			X	X
Lichens				
Rare Leafy (arboreal) Lichens				
Hypogymnia duplicata	X	X	X	

Appendix F

Table F-1. Survey and Manage Plant Species Suspected to Occur in the Middle South Umpqua WAU.

Species	Survey Strategy			
	1	2	3	4
Rare Nitrogen-Fixing Lichens				
Lobaria hallii[d]	X		X	
Pseudocyphellaria rainierensis	X	X	X	
Nitrogen-fixing Lichens				
Lobaria oregana[d]				X
Lobaria pulmonaria[d]				X
Lobaria scrobiculata[d]				X
Pseudocyphellaria anomala[d]				X
Pseudocyphellaria anthraspis[d]				X
Pseudocyphellaria crocata[d]				X
Sticta limbata[d]				X
Sticta fuliginosa[d]				X
Pannaria saubinettii[d]				X
Peltigera collina[d]				X
Nephroma resupinatum[d]				X

d = Species documented as occurring in the South River Resource Area.

Survey Strategies:
1= Manage Known Sites
2= Survey Prior to Activities and Manage Sites
3= Conducts Extensive Surveys and Manage Sites
4= Conduct General Regional Surveys

Appendix G

Roads

Table G-1. Roads in the Middle South Umpqua WAU to Consider Decommissioning.

Road Number	Miles	Surface Type	Subwatershed
29-6-29.02A	0.16	Rock	Kent Rice
29-7-25.00A	0.60	Natural	Kent Rice
29-7-25.02C	0.50	Rock	Kent Rice
29-6-34.05B	0.22	Rock	Lane Judd
30-5-10.00A	0.49	Natural	Lane Judd
30-5-10.01A	0.31	Natural	Lane Judd
30-6-4.01B	0.28	Natural	Lane Judd
30-6-9.00A	0.43	Natural	Lane Judd
30-6-9.02A	0.30	Rock	Lane Judd
30-6-10.00A	0.24	Rock	Lane Judd
29-6-21.00B	0.03	Rock	Willis Vandine
29-6-24.00B	0.47	Rock	Willis Vandine
29-6-25.00A	0.46	Rock	Willis Vandine
29-6-25.01A	0.26	Rock	Willis Vandine
29-6-33.01A	0.39	Rock	Willis Vandine
29-6-33.02A	0.35	Rock	Willis Vandine
29-6-34.01C	0.10	Rock	Willis Vandine
30-6-4.04B	0.20	Rock	Willis Vandine
Total	5.79		

Table G-2. Roads Which Could Be Improved in the Middle South Umpqua WAU.

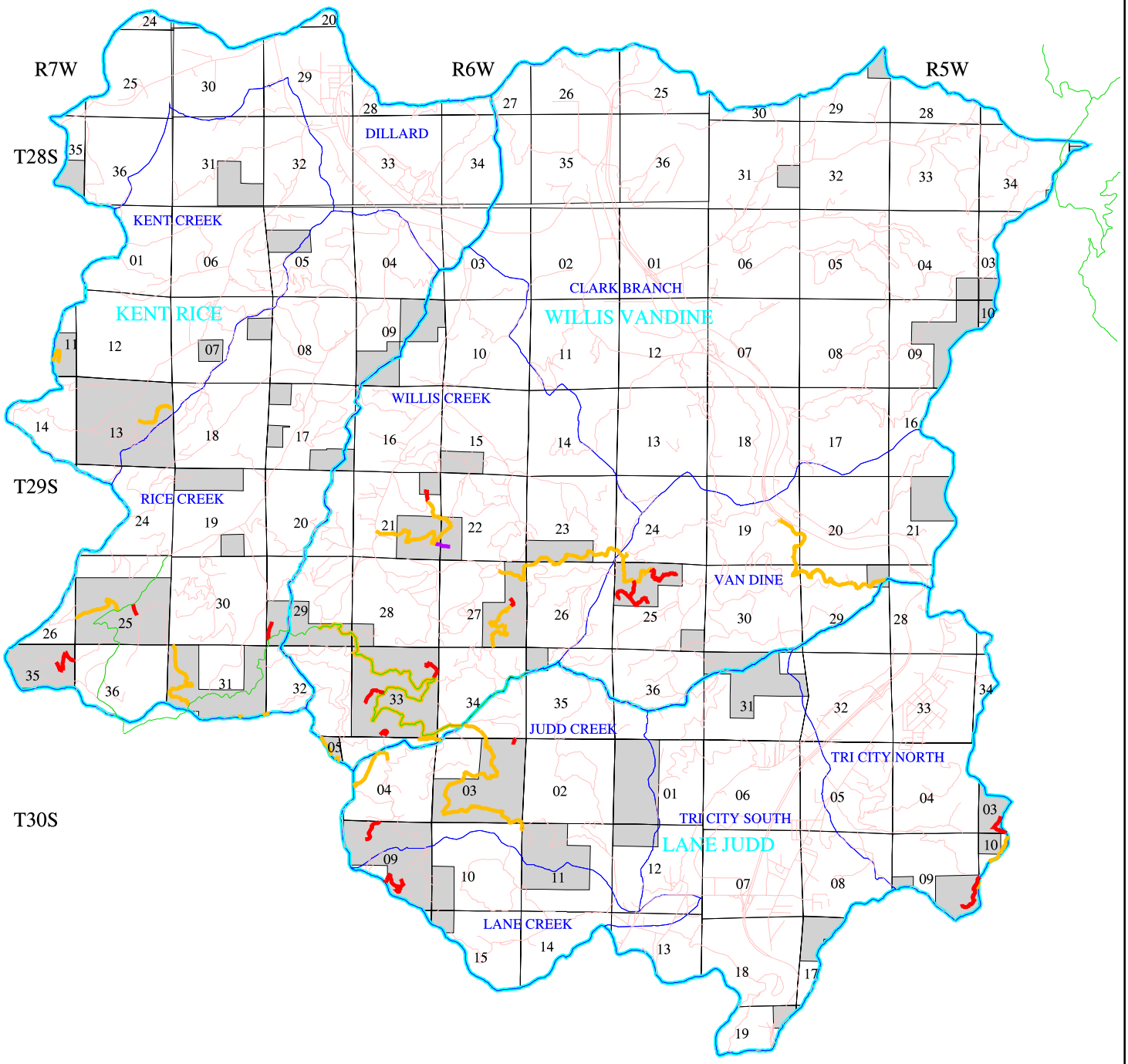
Road Number	Miles	Surface Type	Subwatershed
29-6-19.01C	1.30	Rock	Kent Rice
29-6-31.03A	0.39	Rock	Kent Rice
29-6-31.03B	0.15	Rock	Kent Rice
29-7-11.01B	0.50	Rock	Kent Rice
29-7-13.01A	0.37	Rock	Kent Rice
29-7-25.01A	0.63	Natural	Kent Rice
29-7-25.02A	0.18	Rock	Kent Rice
29-6-34.02A1	1.56	Rock	Lane Judd
29-6-34.02A2	0.49	Rock	Lane Judd
29-6-34.02B	0.50	Rock	Lane Judd
30-5-14.00A	2.48	Rock	Lane Judd
30-5-14.00B	1.43	Rock	Lane Judd
30-5-17.00B	0.29	Natural	Lane Judd
30-5-17.00D	0.04	Natural	Lane Judd
30-6-4.00A	0.73	Rock	Lane Judd
29-5-19.00A	1.93	Natural	Willis Vandine
29-5-19.00B	0.38	Natural	Willis Vandine
29-6-21.00A	1.96	Rock	Willis Vandine
29-6-24.00A	0.84	Rock	Willis Vandine
29-6-24.01A	1.67	Rock	Willis Vandine
29-6-34.01B	0.91	Rock	Willis Vandine
29-6-34.03A	1.30	Rock	Willis Vandine
29-6-34.03B	1.20	Rock	Willis Vandine
29-6-34.03C	2.10	Rock	Willis Vandine
30-6-5.00A	0.33	Rock	Willis Vandine
Total	23.66		

Table G-3. Roads Considered Not Needing Treatment at This Time in the Middle South Umpqua WAU.

Road Number	Miles	Surface Type	Subwatershed
29-6-19.01D	0.10	Rock	Kent Rice
29-6-19.01I	0.50	Rock	Kent Rice
29-6-19.01J	0.30	Rock	Kent Rice
29-6-19.02C	0.30	Rock	Kent Rice
29-6-19.02D	0.10	Rock	Kent Rice
29-6-29.00A	0.80	Rock	Kent Rice
29-6-29.00A2	0.80	Rock	Kent Rice
29-6-29.01A	0.32	Rock	Kent Rice
29-6-31.00A	0.30	Rock	Kent Rice
29-6-31.02A	0.70	Rock	Kent Rice
29-7-12.00A	0.40	Rock	Kent Rice
29-7-12.00B1	0.80	Rock	Kent Rice
29-7-12.00B2	0.35	Rock	Kent Rice
29-7-12.00D	0.80	Rock	Kent Rice
29-7-13.00A	1.05	Rock	Kent Rice
29-7-13.00B	0.65	Rock	Kent Rice
29-7-13.03A	0.68	Rock	Kent Rice
29-7-13.04A	0.66	Rock	Kent Rice
29-7-24.00A1	0.07	Rock	Kent Rice
29-7-24.00A2	0.30	Rock	Kent Rice
29-7-24.00B	0.60	Rock	Kent Rice
29-7-24.00C	0.96	Rock	Kent Rice
29-7-35.02A	1.08	Rock	Kent Rice
29-7-35.04A	1.71	Rock	Kent Rice

Road Number	Miles	Surface Type	Subwatershed
29-7-36.00B	0.61	Rock	Kent Rice
29-6-34.00A	0.20	Rock	Lane Judd
29-6-34.00B	0.75	Rock	Lane Judd
29-6-34.00C	1.10	Rock	Lane Judd
29-6-34.00G	0.49	Rock	Lane Judd
30-6-9.01A	1.00	Rock	Lane Judd
30-6-11.00D	0.50	Rock	Lane Judd
30-6-32.00A	5.20	Bituminous	Lane Judd
29-5-19.01A	2.17	Rock	Willis Vandine
29-5-19.01B	0.88	Rock	Willis Vandine
29-6-15.00A	0.30	Rock	Willis Vandine
29-6-15.01A	0.10	Rock	Willis Vandine
29-6-22.00B	0.13	Rock	Willis Vandine
29-6-22.00C	0.30	Rock	Willis Vandine
29-6-22.01A	0.35	Rock	Willis Vandine
29-6-27.01A	0.15	Rock	Willis Vandine
29-6-28.00B	0.10	Rock	Willis Vandine
29-6-29.00A1	0.20	Rock	Willis Vandine
29-6-29.01A	0.32	Rock	Willis Vandine
29-6-34.00A	0.20	Rock	Willis Vandine
29-6-34.00B	0.75	Rock	Willis Vandine
29-6-34.00C	1.10	Rock	Willis Vandine
29-6-34.01A	0.49	Rock	Willis Vandine
29-6-34.04B	0.10	Rock	Willis Vandine
Total	31.82		

Map G-1. Middle South Umpqua Watershed Analysis Unit
Potential Road Treatment Opportunities



0 1 2 3 4 5 Miles

1:105239

- Main Sysyem Roads
- Roads Decommisioned in 1998
- Potential Roads to Decommission
- Potential Roads to Improve
- Roads
- Drainages
- Subwatershed
- Section Lines
- BLM Administered Lands

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Appendix H

Aquatic Conservation Strategy and Riparian Reserves

Appendix H
Aquatic Conservation Strategy and Riparian Reserves

The four components of the Aquatic Conservation Strategy are Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration. The Aquatic Conservation Strategy (ACS) was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands. The Aquatic Conservation Strategy seeks to prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds.

Aquatic Conservation Strategy objectives can be associated or linked with the National Marine Fisheries Service (NMFS) Matrix of Pathways and Indicators. The factors and indicators may relate to one or more of the nine ACS objectives. Including the NMFS factors and indicators in an ACS objective consistency discussion may provide a common link and logic track between the ACS objectives and the effects determination of a proposed project on Federally-listed fish species (i.e. Umpqua River cutthroat trout).

When determining whether activities retard or prevent attainment of Aquatic Conservation Strategy objectives, the scale of analysis typically would be BLM analytical watersheds (Fifth Field Watershed) or similar units (USDI 1995). The time period would be defined as decades to possibly more than a century (USDA and USDI 1994b and USDI 1995).

ACS Objective 1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Pathways/Indicators Used in BA Effects Matrix:

Habitat Elements/Off-Channel Habitat
Habitat Elements/Refugia
Channel Condition/Dynamics/Floodplain Connectivity
Watershed Conditions/Road Density and Location
Watershed Conditions/Disturbance History
Watershed Conditions/Riparian Reserves

ACS Objective 2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Temperature
Water Quality/Chemical Contamination/Nutrients
Habitat Access/Physical Barriers
Habitat Elements/Off-channel Habitat
Habitat Elements/Refugia
Channel Condition/Dynamics/Floodplain Connectivity
Flow/Hydrology/Increase in Drainage Network
Watershed Conditions/Riparian Reserves

ACS Objective 3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Pathways/Indicators Used in BA Effects Matrix:

Habitat Elements/Substrate
Habitat Elements/Large Woody Debris
Habitat Elements/Pool Frequency
Habitat Elements/Pool Quality
Habitat Elements/Off-channel Habitat
Channel Condition/Dynamics/Width/Depth Ratio
Channel Condition/Streambank Condition
Channel Condition/Dynamics/Floodplain Connectivity
Watershed Conditions/Road Density and Location
Watershed Conditions/Riparian Reserves

ACS Objective 4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Temperature
Water Quality/Sediment/Turbidity
Water Quality/Chemical Contamination/Nutrients
Watershed Conditions/Riparian Reserves

ACS Objective 5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Sediment/Turbidity
Habitat Elements/Substrate
Habitat Elements/Pool Quality
Flow/Hydrology/Change in Peak/Base Flow
Flow/Hydrology/Increase in Drainage Network
Watershed Conditions/Road Density and Location
Watershed Conditions/Disturbance History
Watershed Conditions/Riparian Reserves

ACS Objective 6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Sediment/Turbidity
Habitat Access/Physical Barriers
Habitat Elements/Large Woody Debris
Habitat Elements/Pool Quality
Habitat Elements/Off-channel Habitat
Channel Condition/Dynamics/Floodplain Connectivity
Flow/Hydrology/Change in Peak/Base Flow
Flow/Hydrology/Increase in Drainage Network

ACS Objective 7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

Pathways/Indicators Used in BA Effects Matrix:

Channel Condition/Dynamics/Floodplain Connectivity
Flow/Hydrology/Change in Peak/Base Flow
Flow/Hydrology/Increase in Drainage Network

ACS Objective 8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Temperature
Water Quality/Sediment/Turbidity
Water Quality/Chemical Contamination/Nutrients
Habitat Elements/Substrate
Habitat Elements/Large Woody Debris
Habitat Elements/Pool Frequency
Habitat Elements/Off-Channel Habitat
Channel Condition/Dynamics/Width/Depth Ratio
Channel Condition/Streambank Condition
Channel Condition/Dynamics/Floodplain Connectivity
Watershed Conditions/Riparian Reserves

ACS Objective 9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Temperature
Water Quality/Sediment/Turbidity
Water Quality/Chemical Contamination/Nutrients
Habitat Access/Physical Barriers
Habitat Elements/Substrate
Habitat Elements/Large Woody Debris
Habitat Elements/Pool Frequency
Habitat Elements/Pool Quality
Habitat Elements/Off-channel Habitat
Habitat Elements/Refugia
Channel Condition/Dynamics/Width/Depth Ratio
Channel Condition/Streambank Condition
Channel Condition/Dynamics/Floodplain Connectivity
Watershed Conditions/Riparian Reserves

Riparian Reserves are associated in the NMFS Matrix of Pathways and Indicators with seven of the nine Aquatic Conservation Strategy objectives. Riparian Reserves generally parallel the stream network, but include other areas necessary for maintaining hydrologic, geomorphic and ecological processes that directly affect streams, stream processes and fish habitats. Riparian Reserves are expected to provide benefits including:

- maintaining streambank integrity (ACS objectives 3, 8 and 9)
- maintaining and recruiting large woody debris and other vegetative debris to provide aquatic habitat and filter suspended sediments. The trapped sediments would absorb and store water. This water would be available during summer months to supplement low summer flows. (ACS objectives 3, 5, 6 and 8)
- the large woody debris would help regulate streamflows by dissipating energy, thus moderating peak streamflows and protecting the morphology of stream channels (ACS objectives 3, 8 and 9)
- providing a nutrient source and water for aquatic and terrestrial species (ACS objectives 2, 4, 8 and 9)
- maintaining shade and riparian climate (ACS objectives 2, 4, 8 and 9)
- providing sediment filtration from upslope activities (ACS objectives 5, 6, 8 and 9)
- enhancing habitat for species dependent on the transition zone between upslope and riparian areas (ACS objectives 1, 2, 4, 8 and 9)
- improving travel and dispersal corridors for terrestrial animals and plants and providing greater connectivity within the watershed (ACS objectives 1, 2, 3, 6 and 8)
- maintaining surface and ground water systems as exchange areas for water, sediment, and nutrients (ACS objectives 2, 4, 6 and 8)
- providing for the creation of and maintenance of pool habitat, both for frequency and quality (ACS objectives 3, 6, 8 and 9)
- providing lateral, longitudinal, and drainage network connections, which include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia (ACS objectives 1, 2, 6, 7, 8 and 9).

Appendix I
Timber Harvesting

Appendix I
Timber Harvesting

A long range timber harvesting plan has been initiated for the South River Resource Area. The timber harvesting planning went through a rigorous process to determine suitable timber harvesting locations. This process continues to be refined.

The first step in the selection process of potential harvest areas was to identify all available and suitable stands. Information from GIS was used to identify Matrix lands greater than 80 years old and not located in reserved areas, such as Riparian Reserves, LSRs, TPCC Nonsuitable Woodland areas, owl core areas, or other administratively withdrawn areas. The remaining available stands were identified as being potential harvest areas. Birthdates (Dk) in the Forest Operation Inventory (FOI) were used to determine which stands were greater than 80 years old.

Interpretation of aerial photographs and GIS themes were used to identify suitable harvest areas and define logical unit boundaries. Unit boundaries were established within subwatershed (sixth field watershed) boundaries. Small areas (generally less than two acres) were not mapped as harvestable unless they could be harvested from an existing road. Some stands greater than 80 years old did not appear (as determined by aerial photograph interpretation) to have enough merchantable trees to make a viable unit after retention tree requirements were met. Those areas were not identified for harvesting at this time.

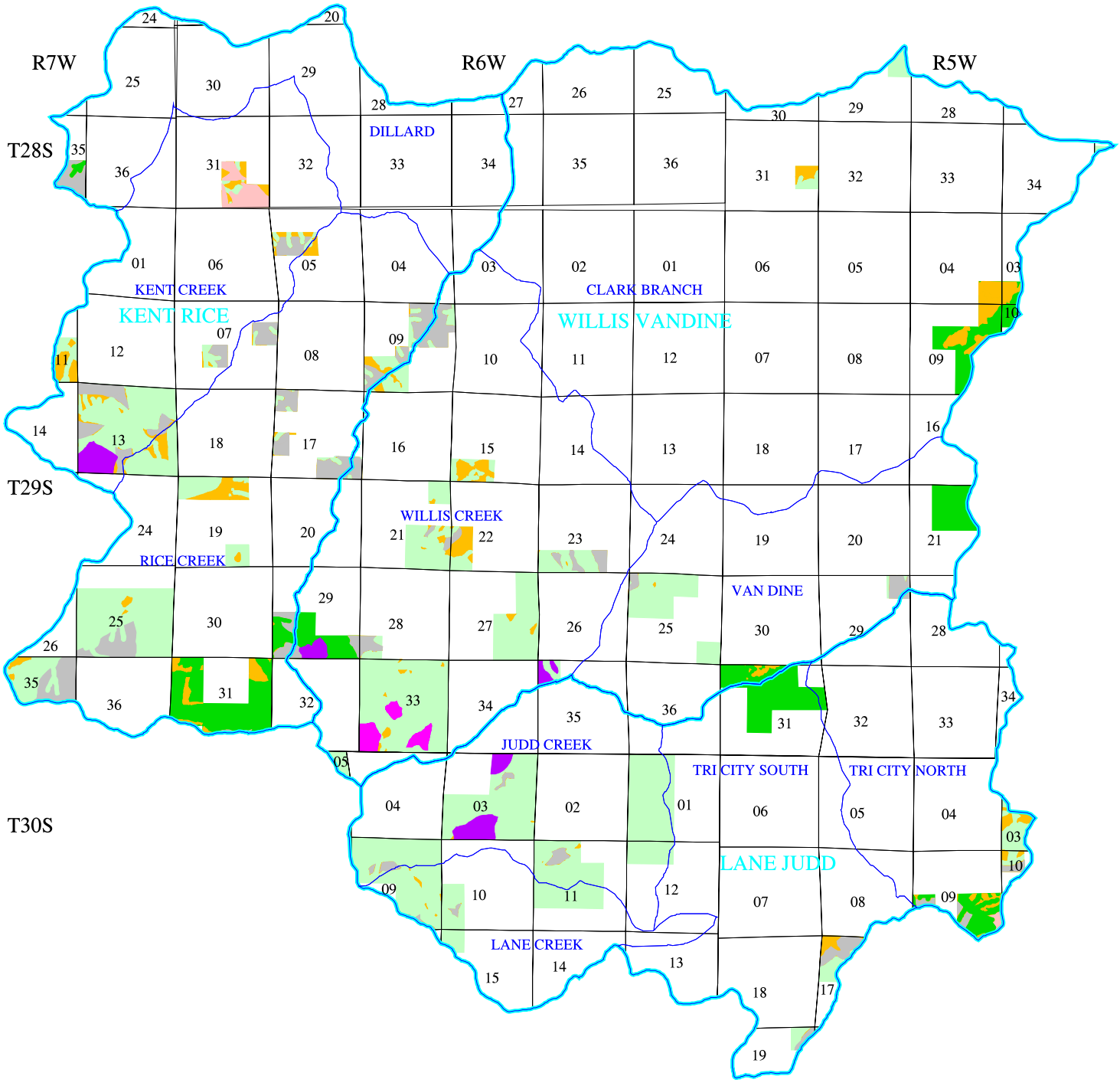
The identified harvest units were digitized into a GIS theme. The digitized harvest units were used to develop a timber sale plan through the year 2024 by attempting to balance timber harvesting equally across all watersheds in the South River Resource Area over time. The timber sale plan assumed timber harvesting would occur in each subwatershed at a level proportional to the number of acres currently available for timber harvesting, with one-third of the available acres in GFMA planned to be harvested in each of the first three decades. Timber harvesting of approximately 1,200 acres per decade was planned within Connectivity/Diversity Blocks in the resource area while maintaining 25 to 30 percent of each Connectivity/Diversity Block in late-successional forests.

Another step was to rank each subwatershed's relative importance to the terrestrial wildlife, hydrology, and fisheries resources. The goals were to identify subwatersheds or areas within a subwatershed where delaying timber harvesting would benefit a resource and what subwatersheds would be impacted the least by timber harvests. In general, subwatersheds with the least amount of BLM-administered land and the fewest available acres for timber harvesting were identified as the places to plan timber harvests first.

The latest step was to evaluate all available timber harvesting units previously identified where harvesting could occur with acceptable impacts to the wildlife, hydrology, and fisheries resources. Potential priority timber harvesting units were areas that did not have obvious conflicts with wildlife, fisheries, or hydrology and were considered to be physically harvestable (see Map I-1). Changes to unit size and shape would be anticipated after extensive field review. Other areas having some concern from wildlife, fisheries, or

hydrology, generally, would be considered for timber harvesting after the priority areas. Although, occasions may occur where a lower priority area for timber harvesting may be harvested before a higher priority area, such as if including a lower priority unit in a sale would allow decommissioning of a road facilitating recovery of a larger area.

Map I-1. Middle South Umpqua Watershed Analysis Unit
Potential Harvest Areas on Matrix Land



0 1 2 3 4 5 Miles

1:101938

- Drainages
- Subwatershed
- Section Lines
- Potential 2001 through 2004 Commercial Thinnings
- Potential Future Commercial Thinnings
- Recent Regeneration Harvests
- Potential 2001 Through 2004 Regeneration Harvest Areas
- Potential Future Regeneration Harvests

Land Use Allocations

- CON
- GFMA

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